SIEMENS

ARCADIS Varic

SP

Replacements of Parts

System

Replacement of Parts

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Document revision level

The document corresponds to the version/revision level effective at the time of system delivery. Revisions to hardcopy documentation are not automatically distributed.

Please contact your local Siemens office to order current revision levels.

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Required documents

- ARCADIS Varic wiring diagram
- For the laser targeting device as applicable: Adjustment instructions/laser targeting device RXR2-130.032.01..

Required tools, measurement devices, and accessories

NOTE

All tools, measurement devices, and accessories with the exception of those marked with a "*" are listed along with their specifications in the STC (Service Tools Catalog).

- Standard tool kit*
- Digital multimeter, e.g. Fluke 8060 A — Part no. 97 02 101 Y4290
- Oscilloscope > 50 MHz, e.g. Fluke CombiScope PM 3390 A — Part no. 99 00 861 Y3155
- Dose measurement device
  - e. g. DALI PTW* — no longer in ARTD
  - or NOMEX PTW* — no longer in ARTD
  - or DIADOS PTW — Part no. 97 17 612 Y0388
- Ground wire test meter
  - e.g. Unimed 1000 tester — Part no. 51 38 727 Y0766
- 1 set of resolution tests — e.g. part no. 28 71 820 RE999
- 1 set of radiation filters — e.g. part no. 97 98 596 G5321
- Centering cross — e.g. part no. 96 60 051 RE999
- WPS heat conducting paste — e.g. part no. 20 48 650 SRN 6400
- 200 N spring scale — e.g. part no. 44 15 113 RH090
- Torque wrench 20 Nm to 100 Nm — e.g. part no. 80 86 159 RE999
- Optimol Viscogen KL 300, 50 ml — Part no. 72 79 107
- Sealing compound* — Part no. 20 49 716 SRN 6002

Text emphasis

⚠ DANGER	**DANGER indicates an immediate danger of death or serious physical injury.** ➪ **n.a.**
⚠WARNING	**WARNING indicates a danger that may lead to death or serious physical injury.** ➪ **n.a.**
⚠CAUTION	**CAUTION used with the safety alert symbol indicates a risk of minor or moderate physical injury and/or damage to property.** ➪ **n.a.**
NOTICE	**NOTICE used without the safety alert symbol indicates a risk that if disregarded will lead or may lead to a situation which may result in an undesirable result or state other than death, physical injury or damage to property.** ➪ **n.a.**
NOTE	**NOTE contains information provided with special emphasis to facilitate proper use of the equipment or proper execution of a procedure, i.e. hints, tips.**

Symbols

Checks and adjustments that must be performed with radiation ON are identified by the radiation warning symbol.

This symbol means "Dangerous voltage".

This symbol means "Attention, refer to the documentation".

This symbol indicates components sensitive to electrostatic discharge (ESD).

Service, shutdown, hibernation, handover to the customer

⚠WARNING

Switch off via hibernation (version VB13C and later) after service or before handover to the customer is not sufficient.

Various error messages can appear after the next system boot and configuration changes are not adopted.

- ➪ **For correct saving of the changed configurations, a shutdown must be performed. Shut down the system via the upper monitor menu bar <Options>-<End Session>-<Shut Down System> and then press the off key on the monitor trolley.**

NOTE

Before the system is handed over to the customer, the system must be shut down via the menu bar <Options>-<End Session>-<Shut Down System>.

Switch off via hibernation (on/off button on the monitor trolley) is not sufficient.

Safety information and protective measures

General safety information (in existing documents)

⚠WARNING

Danger of injuries, death or material damage.

Non-compliance can lead to death, injury or material damage.

Please note:

- **➪ The product-specific safety notes in these instructions,**
- **➪ The general safety information in TD00-000.860.01... and**
- **➪ The safety information in accordance with ARTD Part 2.**

General electrical safety information

⚠WARNING

Electrical safety!

Non-compliance can lead to severe injury or even death, as well as material damage.

- **➪ Parts under electrical voltage are accessible when the covers are open. To avoid danger, disconnect the system from the power supply before opening the covers. Disconnect the power plug.**
- **➪ If an uninterruptible power supply (UPS) is installed in the system, the voltage output of the UPS must also be deenergized or the voltage output plug must be disconnected.**
- **➪ If work steps must be performed using electrical power, the general safety information according to TD00-000.860.01 must be observed.**

⚠CAUTION

Electrical voltage!

Non-compliance can result in material damage.

- **➪ When working on the system, ESD regulations must be observed.**

Radiation safety information

⚠WARNING

X-ray radiation!

Non-compliance can lead to illness, irreversible damage to body cells and the genotype, severe injury and even death.

During work on the system in which radiation must be released, the radiation protection directives and the rules for radiation protection according to ARTD-002.731.02.. must be complied with.

Please note:

- ➪ **Use available radiation protection devices.**
- ➪ **Wear radiation protection clothing (lead apron).**
- ➪ **Stay as far away as possible from the radiation source.**
- ➪ **Release radiation only if necessary.**
- ➪ **Set the radiation activity as low as possible. (Low kV and mA values, short radiation time)**
- ➪ **Release radiation for as short a time as possible.**
- ➪ **Checks requiring the release of radiation are identified by the radiation warning symbol shown on the left.**

Safety information, mechanical

⚠CAUTION

Danger of burns from hot parts or components!

Non-observance can lead to mild to moderately severe burns, particularly on the hands.

- ➪ **When the covers are opened, parts and components (e.g. power supply components, heat sinks, electromagnetic brakes) are accessible which during operation can reach temperatures of > 50 degrees Celsius. To avoid burns, switch off the system and let it cool down for at least 5 minutes before touching any parts or components.**

⚠CAUTION

Danger of injuries from mechanical parts!

Non-observance can lead to mild to moderately severe injuries, particularly to the hands.

- ➪ **When the cover panels are opened, parts such as plugs, threaded bolts, cut-off cable ties, and sharp component edges are exposed. Inattention can lead to skin injuries (crushing, scrapes, cuts), particularly to the hands.**
- ➪ **Work steps carried out on such parts and components must be performed with particular attention and caution.**
- ➪ **Wear work gloves if necessary.**

Safety information - risk of infection

⚠WARNING

Risk of infection due to pathogens!

Non-compliance can lead to severe injury and even death.

- ➪ **This product can be contaminated with infected blood or other bodily fluids.**
- ➪ **Avoid all contact with blood or other bodily fluids!**
- ➪ **Strictly observe the safety information in ARTD-002.731.37.. regarding prevention of infectious diseases during customer service calls.**

Laser light localizer option

⚠CAUTION

Laser emissions!

This product contains class 2 lasers. (USA: Laser class 2)

Non-observance can lead to injury, particularly to the retina of the eye, and can thus lead to irreversible visual impairment.

- ➪ **Observe the safety information in ARTD-002.731.03... When using the laser light localizer, do not look directly into the laser beam.**

NOTE

Laser emissions!

There is no immediate danger to the eye (blinking reflex). Nevertheless, do not look directly into the laser beam.

Information on the protective conductor resistance test

Observe the instructions in the "Safety Rules for Installation and Repair" (ARTD-002.731.17 ...).

The protective conductor resistance must be measured after every intervention in the system.

However, documentation of the measured values is required only during periodic safety checks.

If parts/components that can significantly influence the protective conductor resistance (e.g., replacement of the power cable, replacement of the power-up module, replacement of multi-pole connection cables which also create the protective conductor connection between system parts (e.g., monitor cable or C-arm cable)) are replaced or if protective conductor connections have been repaired, the protective conductor resistance must be measured. The values must be documented and evaluated in the protective conductor resistance protocol.

NOTE

For evaluation purposes, the first measured value and the values documented during maintenance or safety checks must be compared to the measured values. A sudden or unexpected increase in the measured values may indicate a defect in the protective conductor connections - even if the limit value of 0.2 ohms is not exceeded. (Protective conductor or contacts).

The measurement must be performed according to DIN VDE 0751, Part 1 (see ARTD Part 2). The protective conductor resistance for all touchable conductive parts must be measured during the normal operating state of the system.

Make sure that control cables or data cables between the components of the system are not mistaken for protective conductor connections.

During the measurement, the power cable and additional connection cables which also create the protective conductor connection between system parts (e.g. monitor cable between the basic unit and monitor trolley) must be moved section by section to detect cable breaks.

The protective conductor resistance must not exceed 0.2 Ohms.

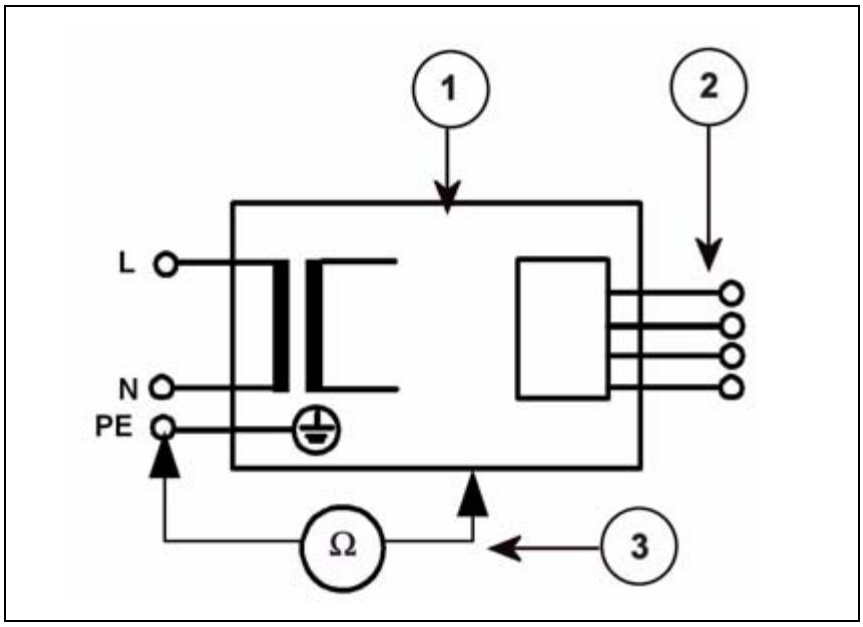

Fig. 1: Measuring circuit for measuring the protective conductor resistance for units that are disconnected from power, in compliance with DIN VDE 0751-1/2001-10, Fig. C2.

Pos. 1 = System

Pos. 2 = Application part type B (if available)

Pos. 3 = Measurement setup (integrated into measuring device)

System leakage current measurement information

NOTE

If parts in the primary circuit (e.g. power cable, line filter, power transformers, or complete ON/OFF assemblies) are replaced during service work, the system leakage current measurement must be subsequently performed and recorded as a repeat measurement.

However, the first measured value must be newly determined and a new protocol be must created under the following conditions:

- Lack of system leakage current measurement documentation.

- When local line voltage or line frequency deviates from the line voltage and line frequency values documented in the protocol (e.g., in the event of a site/operator change)

- When a different procedure for measuring the system leakage current than the one documented in the protocol is used.

For the purpose of traceability, reference to the new protocol must be written in the old protocol. The reason for newly determining the first measured value must be documented and confirmed with a name and signature.

Observe the instructions in the "Safety Rules for Installation and Repair" (ARTD-002.731.17 ...).

⚠WARNING

Electrical voltage!

Non-compliance can lead to severe injury and even death.

➪ **The leakage current measurement may be performed on systems of protection class I only after the protective conductor test has been passed.**

First measured value

The first measured value was already determined and documented in the system leakage current protocol. The measuring procedure was also recorded.

The measurement was performed with the recorded line voltage, line frequency and with the recorded measuring equipment.

Measurement

Perform the measurement according to DIN VDE 0751, Part 1 (see ARTD-002.731.17....), and record the determined value.

The measuring procedure indicated in the protocol must be used.

If the first measured value has to be newly determined (see previous information), a measuring procedure can be selected (direct measurement or differential measurement).

Measurement of the system leakage current according to the differential current method (measurement setup according to (Fig. 2 / p. 16)) must be given preference, since this method is not dangerous to the person performing the measurement and other persons.

However, please note the minimum resolution of the leakage current measuring instrument and any additional manufacturer's data restricting the use of the measuring device.

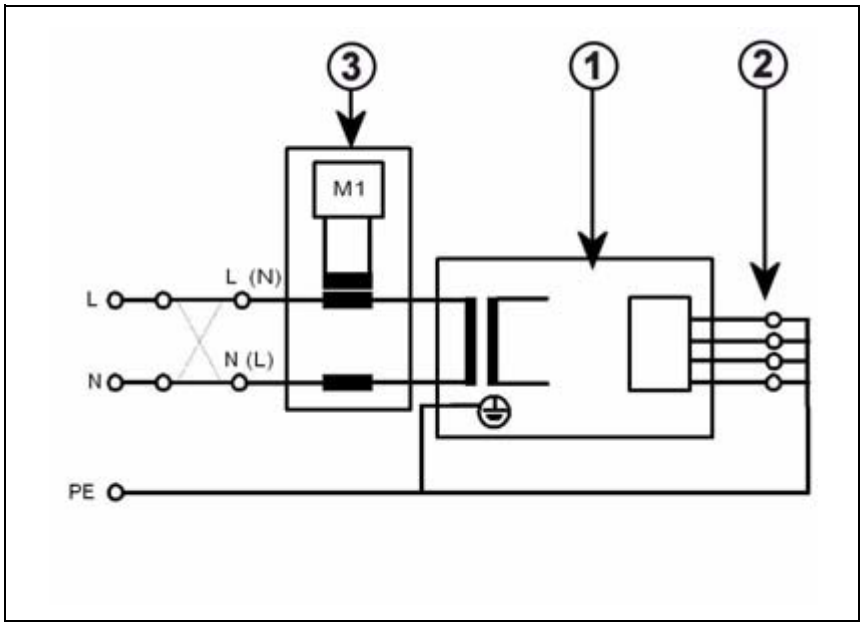

Fig. 2: Measuring circuit for measuring the system leakage current according to the differential current method in compliance with DIN VDE 0751-1/2001-10, Fig. C6 for protection

class I.

Pos. 1 = System

Pos. 2 = Application part type B (if available)

Pos. 3 = Measurement setup (integrated into measuring device)

If the direct measurement of the system leakage current is used (measurement setup according to (Fig. 3 / p. 17)), the system must be insulated during the measurement and must not be touched.

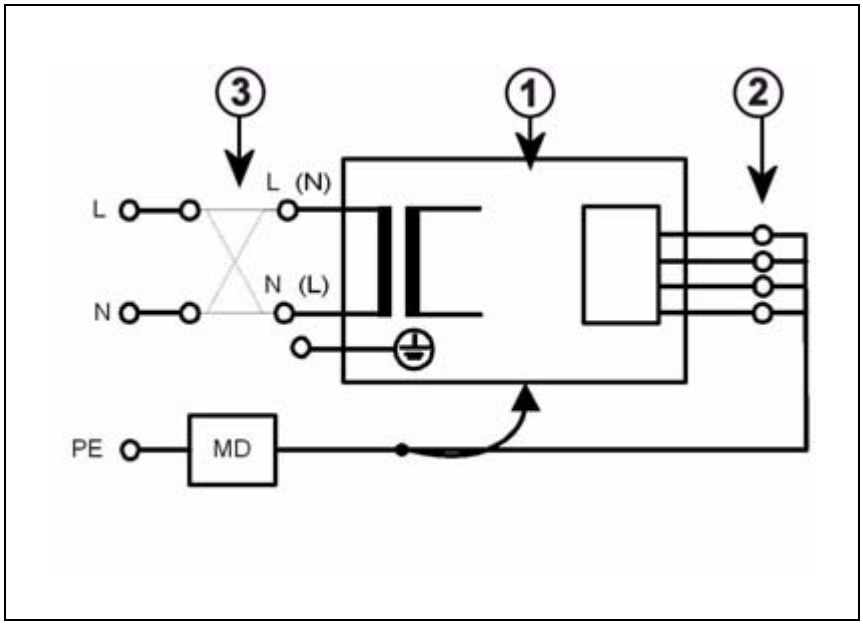

Fig. 3: Measuring circuit for direct measurement of the system leakage current in compliance with DIN VDE 0751-1/2001-10, Fig. C5 for protection class I.

Pos. 1 = System

Pos. 2 = Application part type B (if available)

Pos. 3 = Measurement setup (integrated into measuring device)

⚠WARNING

Electrical voltage!

Non-compliance can lead to severe injury and even death.

- ➪ **No housing parts of the system may be touched during direct measurement of the leakage current (measurement setup according to (Fig. 3 / p. 17)).**
- ➪ **Third-person access to the system must be prevented.**

The system must be switched on during measurement. Measuring devices with automated measuring sequences must therefore be set to manual measurement.

Enter the highest value in the system leakage current protocol.

This value must not exceed the permissible system leakage current values according to DIN VDE 0751-1/2001-10, Table F.1, line "system leakage current for units according to remarks 1 and 3" of 2.5 mA.

Do not exceed 2.5 mA.

Measure and record the current line voltage. If the measured line voltage deviates from the nominal voltage, correct the measured value to the value corresponding to a measurement at the nominal value of the line voltage. This must also be documented.

Document the measuring procedure (differential measurement or direct measurement) and the measuring device used (designation and serial number).

In the case of repeat measurements, the measured value must also be evaluated.

NOTE

For evaluation purposes, the first measured value and the values documented during maintenance or safety checks must be compared to the measured values. A sudden or unexpected increase in the measured values may indicate that a fault has occurred in the primary power supply circuit (insulation damage, damage from moisture, defective interference suppressor, etc.) - even if the limit value of 2.5 mA is not exceeded.

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The evaluation is not necessary in the case of a new determination.

File the protocol sheet in the system binder or log book.

Information on navigation systems installed as options

This ARCADIS system can be used in combination with navigation systems supplied by various navigation system manufacturers.

The use of the navigation system lies within the responsibility of the customer.

Some service tasks can affect the accuracy of the navigation system.

⚠WARNING

Some service work steps performed on the ARCADIS system will lead to inaccuracy in a navigation system installed optionally.

Failure to take the necessary steps to address this situation can lead to severe injuries in the patient.

- ➪ **If service work steps are performed on the ARCADIS system that can affect the accuracy of optionally installed navigation systems (see list below), the customer must be notified verbally and/or in writing that the accuracy of the installed navigation system is no longer guaranteed after such service work steps have been performed, and that the accuracy of the navigation system must be checked and certified before it is used again.**

Service work steps that can affect the accuracy of the installed navigation system:

- All work steps that affect the geometry of the C-arm and its components, such as:
  - ➪ Removing or installing the I.I.
  - ➪ Removing or installing the I.I. housing
  - ➪ Removing or installing the I.I. mounting ring on the I.I.
  - ➪ Removing or installing the I.I. grid
  - ➪ Removing or installing the I.I. optics
  - ➪ Removing or installing the CCD camera
  - ➪ Removing or installing any mechanical components of the C-arm
- Any adjustments that alter the geometry of the imaging components, such as:
  - ➪ Adjustment of camera optics (optical sharpness, image size)
  - ➪ Adjustment of camera rotation (positioning with respect to I.I. optics)
  - ➪ Adjustment of I.I. geometry and sharpness (I.I. mini voltage supply)
- Any subsequent installation of released options that affect the geometry of the C-arm and its components, such as:
  - ➪ Integrated laser light localizer option (geometric alteration)
  - ➪ I.I.laser light localizer option (weight alteration)
  - ➪ 2D Navigation Option (Attachment of altered mounting ring to I.I.)

Cover panels

NOTE	**Observe the safety information in this chapter!**

Main system, rear cover

Removing the rear cover

1. Engage the foot brake.
2. Remove the screws from the rear cover.
3. Pull the cover back approximately 25 cm.
4. Unscrew the ground wire from the cover panel.
5. Pull the cover completely off and tilt it down.
6. Lift up the cover and raise both lateral metal brackets from the guide rails.

Installing the back cover

1. Fit the lateral metal brackets back into the guide rail.
2. Reattach the protective conductor to the rear cover.
3. Lift the cover and push it forward. Be careful with the EMC spring contact.
4. Reattach the cover and tighten the screws.

Main system, SIREPHOS cover panel

NOTE	**The SIREPHOS cover panel is sealed all around against dirt contamination using a sealing compound (part no. 20 49 716).**

1. Loosen the cover screws of the SIREPHOS cover.
2. Use a sharp knife to cut open the sealing compound all around the cover.
3. Lift off the SIREPHOS cover.
4. Remove the sealing compound residue from the cover and from the SIREPHOS.
5. On completing service, place the SIREPHOS cover on the SIREPHOS and completely seal it with sealing compound.
6. Use a paper towel to wipe off excess sealing compound.
7. Once again, use sealing compound 2049716 to seal the SIREPHOS cover completely.
8. Refasten the SIREPHOS cover with the cover screws. If necessary, apply side pressure to the SIREPHOS cover until the sealing compound hardens.

Monitor trolley

Removing the cover panels

1. Remove the 4 screws from the middle back cover to access the imaging system (rear).
2. Remove the upper back cover plate of the log book compartment.
3. Remove the lower back cover to access the power supply.
4. Remove the front cover to access the imaging system (front).

Installing the cover panels

1. Install the covers in reverse order.

Concluding steps

NOTE **Observe the guidelines on the protective conductor test and the leakage current measurement in this chapter.**

- If necessary, perform the leakage current measurement.
- After completing all work steps and closing all the cover panels, perform the protective conductor test in accordance with ARTD-002.731.17...
  - ➪ The protective conductor resistance must not exceed 0.2 Ohms.

D1 control board

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Make sure that LED V400 on the D2 board is off prior to performing any work on boards D1 and D2. This should occur approximately 3 minutes after switching OFF the ARCADIS system.**

Replacement and additional work steps

1. Make sure that a current backup of the main system is available.
2. Read out the load counter of the Sirephos (Path: <Service>-<Main System>-<Adjustment>-<Load Counter>).
3. Document this value because it is necessary for a Sirephos replacement. If the D1 is defective, the load count is available in the offline report (path:<Service>-<Reports>-<Main System>-<Configuration Offline").
4. Disconnect and replace the D1 board.
5. Install the new D1 board and reconnect all cable connections. Be sure that the shielding and ground wire connections are connected correctly.
6. Set the jumpers and switches according to the wiring diagram.
7. Perform the download procedure for the D1 control board (path: <Service>-<Main System> -<Download>-<C-Arm>).

NOTE

If the EE-PROM of the replacement D1 is not completely deleted, it will be automatically cleared after the host software has been downloaded. The delete procedure is indicated as "d" on the 7-segment display and requires approximately 5 minutes. During the delete procedure, do not switch off the system or perform additional programming. After successful deletion, the 7-segment display returns to the normal status display.

8. After download, wait for the system to reboot.

NOTE

With software version VB11A, the system serial number (1xxxx) must be entered and saved manually under <Main System>-<Configuration>-<Main System> before a restore of the main system is carried out.

9. Restore the main system parameters (path: <Service>-<Backup & Restore> "Packages" - "Main System").
10. Perform a generator adjustment (path: <Service>-<Main System>-<Adjustment>-<Generator Adjust.>).

11. Check the dose rate control and adjust it as necessary (path: <Service>-<Main System>-<Adjustment>-<Dose rate>).
12. Ensure that camera rotation is functioning properly. Adjust, if necessary.
13. Ensure that the collimator is functioning properly. Adjust, if necessary.
14. Check the display functions and the setting of the blades on the monitor. Adjust, if necessary.
15. Ensure that the area dose measurement device (if present) is functioning correctly.
16. Test the FL/PFL/DR and direct exposure functions of the system.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

D2 power board

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Make sure that LED V400 is off prior to performing any work on boards D1 and D2. This should occur approximately 3 minutes after switching OFF the ARCADIS system.**

1. Disconnect D1 and D2 boards completely.
2. Disconnect the cables between boards D1 and D2.
3. Remove boards D1 and D2.
4. Apply heat conducting paste to the heat sink for the power semiconductor on the new D2 board.
5. Reinstall boards D2 and D1 and reattach all connections.
6. Ensure that the shielding and ground connections are positioned correctly.
7. Perform the kV offset adjustment and the generator adjustment (filament learning).
8. Test the FL/PFL/DR and direct exposure functions, if there is a cassette holder.

D3 interface board

⚠WARNING **Electrical voltage!**

See chapter 1, Safety Information.

➪ **Switch system power supply off and disconnect the power plug.**

1. Replace the D3 interface board.
2. Check the +26.75 V voltage for the I.I. mini-voltage supply. Adjust it, if necessary. Refer to chapter 3 of these instructions, Checking the Operating Voltages.
3. Check the radiation release/format switchover/vertical column movement functions.

D40 board for downward movement of the lifting column

⚠WARNING **Electrical voltage!**

See chapter 1, Safety Information.

➪ **Switch system power supply off and disconnect the power plug.**

1. Replace the D40 board.
2. Using the operating instructions for the basic system, check both the movements of the C-arm and the signal messages.

M14 power supply, +5 V/+15 V/-15 V

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Switch the system power supply off and disconnect the power plug.**

1. Replace the power supply.
2. Check the power supply voltage and adjust it if necessary. Refer to chapter (Voltages / p. 89).

M13 power supply 230V/13V

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Switch the system power supply off and disconnect the power plug.**

1. Replace the power supply.
2. Check the power supply voltage according to chapter (Voltages / p. 89).

I.I. mini-voltage supply

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Switch the system power supply off and disconnect the power plug.**

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Prior to removing the mini-voltage supply, the system must be switched off for at least 3 minutes, until the high voltage in the system and in the I.I. mini-voltage supply dissipates.**

Roederstein I.I. mini voltage supply

Fig. 4: I. I. mini-voltage supply

1. Remove the cylindric cover on the I.I..
2. Replace the I.I. mini-voltage supply (Fig. 4 / p. 30).
3. Refer to the I.I. test certificate 1 for the E1/E2/E3 and A voltages. Check and adjust them as necessary according to the "Voltages" chapter.
4. Check the functions and adjustments of the collimator. Readjust them, if necessary.
5. Check the display functions and the setting of the blades on the monitor. Adjust them, if necessary.

6. Check the overall resolution according to the IQ test.
7. Perform the IQ test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Spellman I.I. mini voltage supply

Fig. 5: 9 inch / 23 cm I.I. with Spellman I.I. mini power supply

Pos. 1 Mounting screws
Pos. 2 Plugs E1 to E3, Penning and anode
Pos. 3 Ribbon cables
Pos. 4 DIP switches
Pos. 5 Test points

1. Remove the cover on the I.I.
2. Replace the I.I. mini-voltage supply.
3. Refer to the I.I. test certificate 1for the E1/E2/E3 and A voltages. Check and adjust them as necessary according to the "Voltages" chapter.
4. Check the functions and adjustments of the collimator. Readjust them, if necessary.
5. Check the display functions and the setting of the blades on the monitor. Adjust them, if necessary.
6. Check the overall resolution according to the IQ test.
7. Perform the IQ test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Collimator

1. Replace the collimator.
2. Ensure that the collimator is functioning properly and is set correctly. If necessary, adjust it.
3. Ensure that the collimator blades of the iris diaphragm are visible during fluoroscopy in survey format and zoom format on at least 2 sides of the monitor image.
4. Check collimation for direct exposure if a cassette holder is being used.
5. Check the display of the blades on the monitor and adjust it if necessary.
6. Remove the old set of collimator labels near the SIREPHOS and attach the included new labels in the same position.
7. Check that the original collimator labels are the same as the new ones.

Exchanging the SIREPHOS

1. Read out and note the number of resets and the current load counts from the SIREPHOS tank. Path: <Service>-<Main System>-<Adjustment>-<Load Counter>.
2. Open the SIREPHOS cover. See chapter 1, (Cover panels / p. 20).
3. Remove the laser targeting device, if present.
4. Remove the dose measurement chamber, if present.
5. Remove the collimator.
6. Disconnect the SIREPHOS plug.
7. Remove the ground screw for the protective conductor.
8. Remove the rubber stop of the C-arm on the SIREPHOS side. The screws that secure the SIREPHOS are now visible.
9. Remove the SIREPHOS screws. When doing this, have a second person hold the X-ray tube unit.
10. Place the new X-ray tube unit on the guide bolts and secure it with the two Allen screws.
11. Ensure that all cables are routed properly.
12. Reconnect the SIREPHOS plug and secure it.
13. Reconnect the protective conductor using the ground screw.
14. Do not install the rubber stop yet.
15. Reinstall the collimator and connect it.
16. Reinstall the dose measurement chamber/laser targeting device and connect them.

⚠WARNING

X-ray radiation!

See chapter 1, Safety Information.

➪ **Protect against radiation exposure. Wear a lead apron.**

17. Enter the new serial no. of the new single tank. Path: <Service>-<Main System>-<Configuration>-<Load <Counter>.

18. Adjust the generator. Path: <Service>-<Main System>-<Adjustment>-<Generator Adjustment>.
19. Reset the load counter. Path: <Service>-<Main System>-<Adjustment>-<Load <Counter>.
20. Ensure that the collimator is functioning properly and is set correctly.
21. Ensure that the collimator blades are centered in the blanking circle.
22. If possible, loosen the Sirephos screws slightly and tilt the SIREPHOS to adjust it.
23. Retighten the SIREPHOS screws.
24. Ensure that the collimator blades of the iris diaphragm are visible during fluoroscopy in the survey format and zoom format on at least 2 sides of the monitor image.
25. Check the display of the blades on the monitor screen and adjust it as necessary.
26. Check collimation for direct exposure if there is a cassette holder.
27. Reinstall the rubber stop.

28. Ensure that the area/dose product measurement device is functioning properly (if present).
29. Check the setting of the laser targeting device and adjust it as necessary according to the Adjustment Instructions for the Laser Targeting Device, RXR2-130.815.01.
30. Reattach the SIREPHOS cover.
31. Seal the SIREPHOS cover using sealing compound. See chapter 1, (Cover panels / p. 20).

Replacing the camera and the I.I. optics (camera version ≥ 2.0)

Relevant systems: ARCADIS Varic system serial no. 10218, 10219, 10222 and systems with serial no. > 10223; camera version ≥ 2.0 (see ID label).

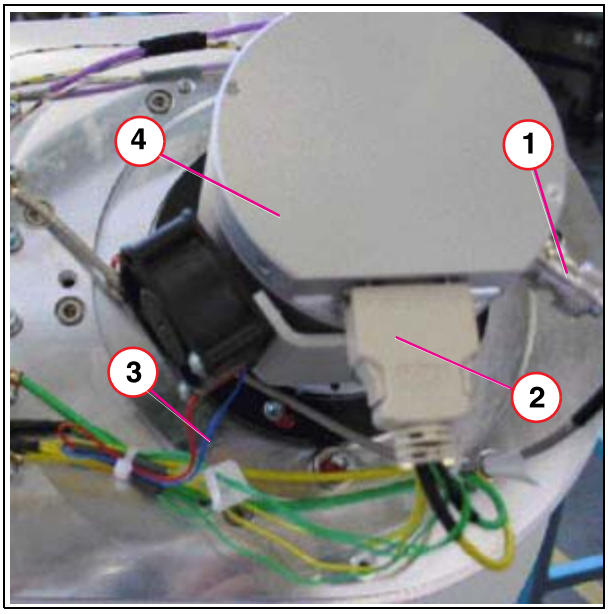

Fig. 6: II _ Connection

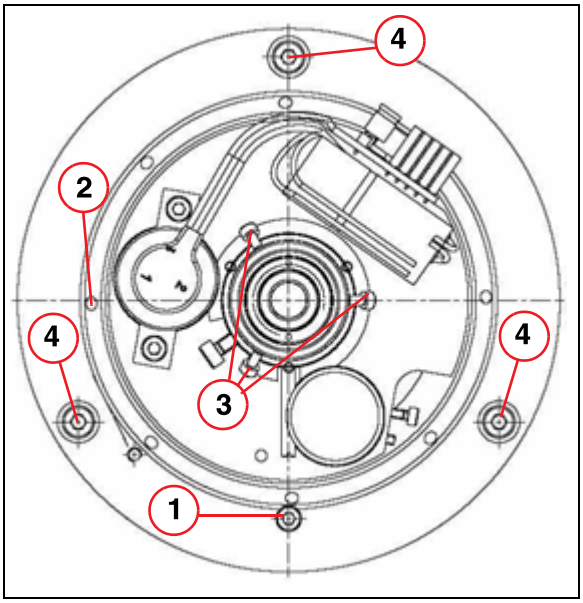

Fig. 7: Replacing the camera and I.I. optics

Removing/replacing the camera

1. Switch the system off.
2. Remove the upper I.I. cover (already removed in (Fig. 6 / p. 36)).
3. Unplug the connectors (1/Fig. 6 / p. 36), (2/Fig. 6 / p. 36) and disconnect the fan wires (3/Fig. 6 / p. 36).
4. Loosen the clamping screw (1/Fig. 7 / p. 36).
5. Rotate the clamping ring (2/Fig. 7 / p. 36)a half rotation in the counterclockwise direction to loosen the camera. For this purpose, insert an Allen key (2.5 mm) into the hole (2/Fig. 7 / p. 36) and push the clamping ring in the counterclockwise direction.
6. Remove the 3 Allen screws (3/Fig. 7 / p. 36).
7. Turn the entire camera (4/Fig. 6 / p. 36) counterclockwise until it is no longer attached. For subsequent reinstallation, count the number of turns when removing the camera. The connector (2/Fig. 6 / p. 36) should be in the position shown in (Fig. 6 / p. 36).
8. Install the (new) camera in reverse order.
9. Adjust the camera and I.I. optics.
10. Perform the IQ test.
11. Complete the country-specific acceptance (§16 partial acceptance... /DHHS...).

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Removing/replacing the I.I. optics

Prerequisites: Camera must already be removed.

1. Remove the 3 M4 screws (4/Fig. 7 / p. 36).
2. Remove the I.I. optics.
3. Install the (new) optics and camera in reverse order.
   ➪ When screwing in the 3 M4 screws (4/Fig. 7 / p. 36), make sure that the optic is pressed against the centering bolts.
4. Adjust the camera and I.I. optics.
5. Perform the IQ test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Adjusting the camera and I.I. optics (camera version ≥ 2.0)

Relevant systems: ARCADIS Varic system serial no. 10218, 10219, 10222 and systems with serial no. >10223; camera version ≥ 2.0 (see ID label).

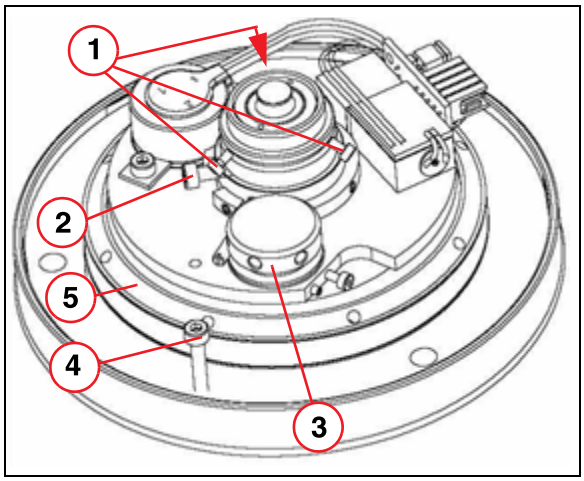

Fig. 8: Adjusting the camera

Centering the camera

NOTE

The camera can be centered by moving the optics. Centering is performed in the factory and should be acceptable. The camera optics must be moved toward the centering bolts.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Reproduction scale adjustment

Prerequisites: Camera centering should be OK.

1. Loosen the clamping screw (4/Fig. 8 / p. 38).
2. Loosen the lock ring (5/Fig. 8 / p. 38).
3. Unplug the connectors (1/Fig. 6 / p. 36), (2/Fig. 6 / p. 36) and disconnect the fan wires (3/Fig. 6 / p. 36).

4. Remove the 3 Allen screws from the camera flange (1/Fig. 8 / p. 38).
5. You can increase/decrease the image size by turning the entire camera. The camera plugs must not be in the same position.
   - ➪ Turn clockwise = larger image
   - ➪ Turn counterclockwise = smaller image

6. Rotate the camera until the plugs are at the same location as prior to the adjustment and retighten the 3 M2 Allen screws (1/Fig. 8 / p. 38).
   - ➪ Tightening torque **14 ± 1Ncm**
7. Tighten the lock ring (5/Fig. 8 / p. 38).
8. Retighten the clamping screw (4/Fig. 8 / p. 38).
9. Reattach the connectors (1/Fig. 6 / p. 36), (2/Fig. 6 / p. 36) and the fan wires (3/Fig. 6 / p. 36).

10. Release fluoro and check the image size. Repeat the adjustment if necessary.
11. Open the service application and adjust the 0 degree position of the image.

    Path: <Service>-<Main System>-<Adjustment>-<Image Rotation>.
12. Perform the IQ test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

- ➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Camera focus

Prerequisites: Camera reproduction scale should be OK.

1. Loosen the focus ring clamping screw (2/Fig. 8 / p. 38).

2. You can adjust the optimum sharpness by turning the focus ring (3/Fig. 8 / p. 38).
3. Release fluoro and check the sharpness. Repeat the adjustment if necessary.
4. Retighten the focus clamping screw (2/Fig. 8 / p. 38).
5. Perform the IQ test.

NOTE

Adjusting the camera focus also has a slight effect on the reproduction scale. The reproduction scale adjustment may have to be repeated.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing the camera and the I.I. optics (camera version < 2.0)

Relevant systems: ARCADIS Varic serial no. < 10218 and 10220, 10221, 10223; or the camera was already replaced with the new camera version ≥ 2.0 (see ID label).

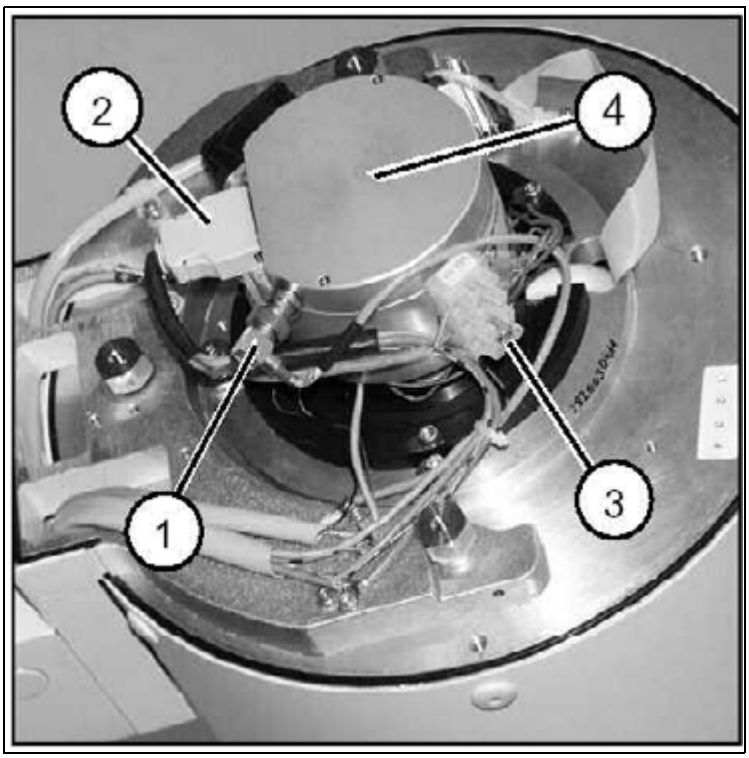

Fig. 9: Replacing the camera and the I. I. optics_1

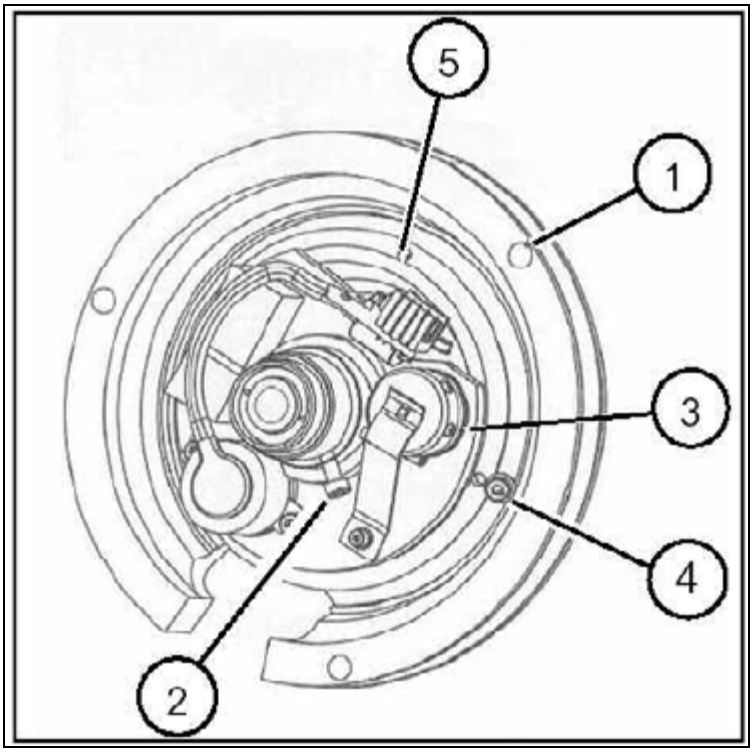

Fig. 10: Replacing the camera and the I. I. optics_2

Removing/replacing the camera

1. Remove the I.I. cover (already removed in (Fig. 9 / p. 41)).
2. Unplug the connectors (1/Fig. 9 / p. 41), (2/Fig. 9 / p. 41) and disconnect the fan wires (3/Fig. 9 / p. 41).
3. Loosen the clamping screw (4/Fig. 10 / p. 42).
4. Rotate the clamping ring (5/Fig. 10 / p. 42) a half rotation in the counterclockwise direction to loosen the camera. For this purpose, insert an Allen wrench (2.5 mm) into the hole (5/Fig. 10 / p. 42) and push the clamping ring in the counterclockwise direction.
5. Turn the entire camera (4/Fig. 9 / p. 41) counterclockwise until it is no longer attached. For subsequent reinstallation, count the number of turns when removing the camera. The connector (2/Fig. 9 / p. 41) should be in the position shown in (Fig. 9 / p. 41).
6. Install the (new) camera in reverse order.
7. Adjust the camera and I.I. optics.
8. Perform the IQ test.
9. Complete the country-specific acceptance (§16 partial acceptance... /DHHS...).

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Removing/replacing the I.I. optics

Prerequisites: Camera must already be removed.

1. Remove the 3 M4 screws (1/Fig. 10 / p. 42).
2. Remove the I.I. optics.
3. Install the (new) optics and camera in reverse order.
4. Adjust the camera and I.I. optics.
5. Perform the IQ test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Adjusting the camera and I. I. optics (camera version < 2.0)

Relevant systems: ARCADIS Varic serial no. < 10218 and 10220, 10221, 10223; or the camera was already replaced with the new camera version ≥ 2.0 (see ID label).

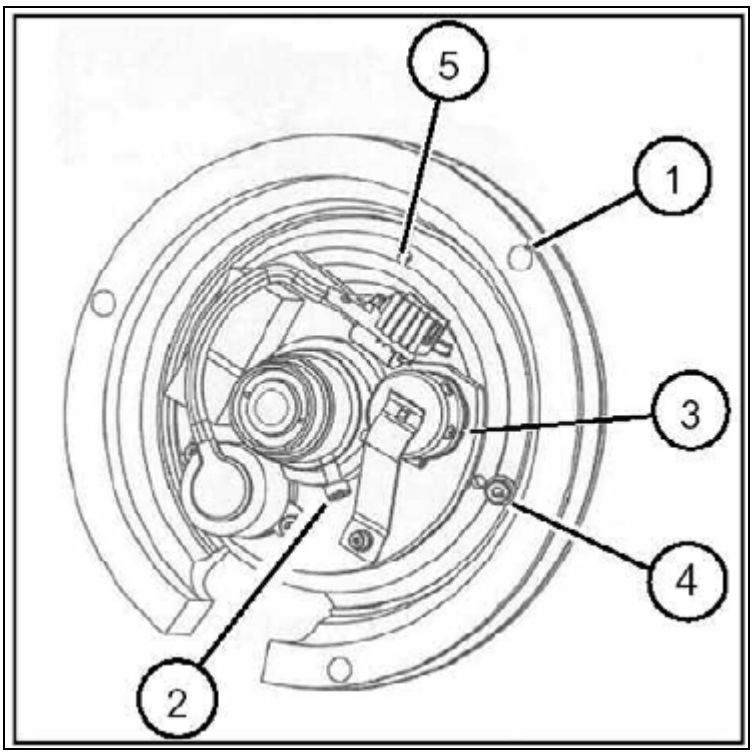

Fig. 11: Replacing the camera and the I. I. optics_2

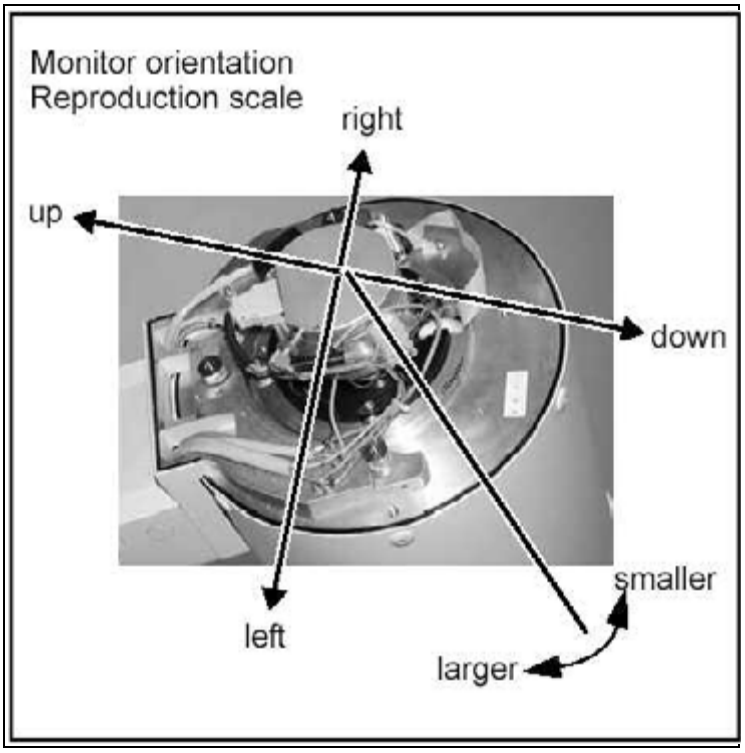

Fig. 12: Monitor orientation

Centering the camera

NOTE

The camera can be centered by moving the optics. Centering is performed in the factory and should be acceptable. The camera optics must be moved toward the centering bolts.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Reproduction scale adjustment

Prerequisites: Camera centering should be OK.

1. Loosen the clamping screw (4/Fig. 11 / p. 44).
2. Loosen the lock ring (5/Fig. 11 / p. 44).

3. Unplug the connectors (1/Fig. 9 / p. 41), (2/Fig. 9 / p. 41) and disconnect the fan wires (3/Fig. 9 / p. 41).
4. You can increase/decrease the image by turning the entire camera (Fig. 12 / p. 45). Always turn it a full turn because the camera plugs should be in the same position.
   - ➪ Turn clockwise = larger image
   - ➪ Turn counterclockwise = smaller image
5. Reattach the connectors (1/Fig. 9 / p. 41), (2/Fig. 9 / p. 41) and the fan wires (3/Fig. 9 / p. 41).
6. Release fluoro and check the image size. Repeat the adjustment if necessary.
7. Retighten the clamping screw (4/Fig. 11 / p. 44).
8. Open the service application and adjust the 0-degree position of the image.

   Path: <Service>-<Main System>-<Adjustment>-<Image Rotation>.
9. Perform the IQ test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

- ➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Camera focus

Prerequisites: Camera centering and camera reproduction scale should be OK.

1. Loosen the focus ring clamping screw (2/Fig. 11 / p. 44).
2. You can adjust the optimum sharpness by turning the focus ring (3/Fig. 11 / p. 44).
3. Release fluoro and check the sharpness. Repeat the adjustment if necessary.
4. Retighten the focus clamping screw (2/Fig. 11 / p. 44).
5. Perform the IQ test.

NOTE

Adjusting the camera focus also has a slight effect on the reproduction scale. The reproduction scale adjustment may have to be repeated.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing the I. I.

Checking the temperature indicator of the new I.I.

1. Prior to removing the I.I., check the temperature indicator of the new I. I.
2. If the inner square field of the indicator is white, the I.I. did not exceed the temperature range. Remove the temperature indicator.
3. If the indicator is discolored (inner field black), proceed according to IQ document RXD-000.038.01.

Removing the I.I.

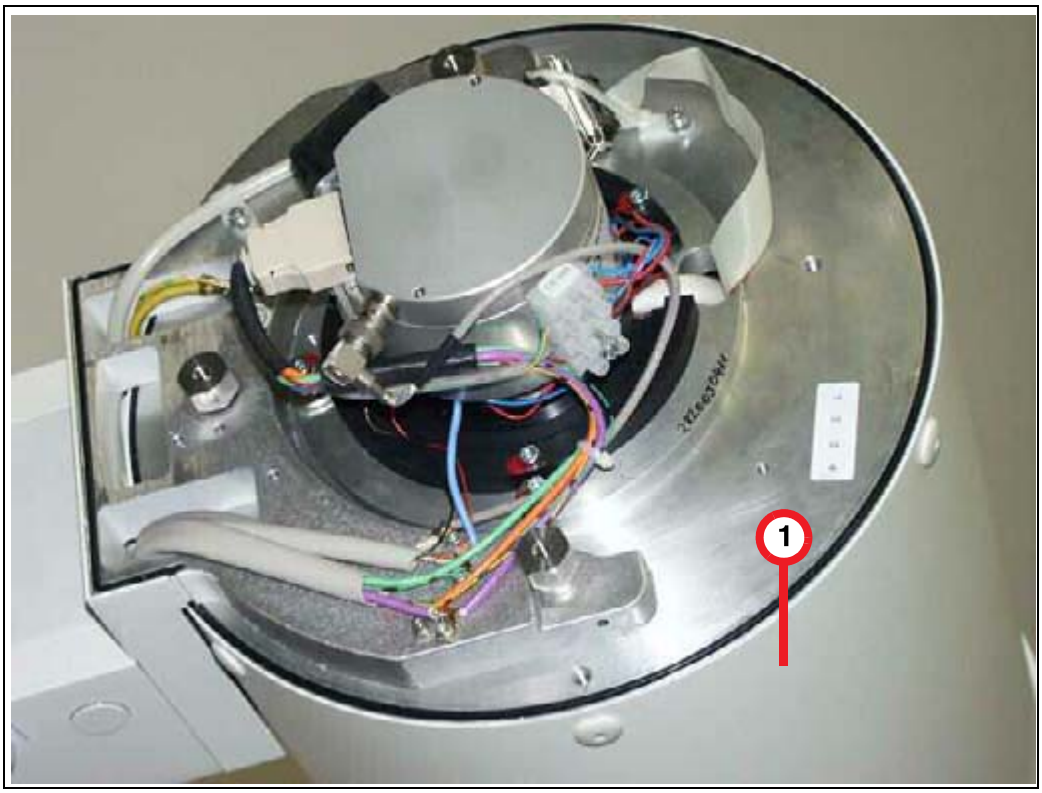

Fig. 13: Removing_the I. I.

⚠CAUTION

Electrical voltage!

See chapter 1, Safety Information.

➪ **Switch OFF the ARCADIS system and wait approximately 3 minutes for the voltage in the I.I. mini-voltage supply to drop.**

1. Rotate the C-arm so that the I.I. is on top.
2. Remove the I. I. cover (see (1/Fig. 13 / p. 48)) and unsolder the cassette switch.

3. Disconnect all cables from the camera.
4. Remove the I.I. optics (incl. camera) refer to "Removing the I.I. Optics"

NOTE

Do not loosen the eccentric screws on the edge of the optics! These are used to center the optics with respect to the I.I. output screen. When removing the optics, make sure that no dust or dirt contaminates the I.I. output window or the optics.

5. Disconnect the cables from the I.I. mini-power supply.
6. Rotate the C-arm so that the I. I. is underneath and the tube assembly is on top.

⚠CAUTION

Risk of crushing!

See chapter 1, Safety Information.

➪ **Apply all C-arm brakes.**

7. Remove the attachment screws from the I.I. mounting. When doing this, hold onto the I.I. Remove the I.I. from the mounting.
8. Remove and disconnect the mini-power supply from the I. I.

Installing the new I.I.

NOTE

When installing the optics make sure that no dust or dirt contaminates the I.I. output window or the optics.

1. Install and connect the mini-power supply.
2. Install (new) I. I., optic and camera in reverse order.
3. Connect the camera cables in reverse order.

Checks and adjustments

1. Check the I.I. electrode voltages according to the test protocol for the I.I.
2. Do not readjust in cases where there are only slight deviations from the values on the test protocol (measurement device tolerances).
3. Check the centering, reproduction scale and camera focusing. Refer to the previous description "Adjusting the Camera and I. I.Optics".
4. Check the setting of the X-iris and readjust it as necessary.
5. Check the display of the blades on the monitor and readjust it if necessary.
6. Check the dose rate and readjust it if necessary.
7. Perform the IQ test. Check the resolution first and readjust the optical resolution of the I.I. optics if necessary. Refer to the previous description "Adjusting the Camera and I.I. Optics".
8. Complete the country-specific acceptance (§16 partial acceptance... /DHHS...).

9. Solder the 2 wires to the cassette switch and remount the I. I. cover.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Dose area product measuring device

1. Switch the system off.
2. Remove the single-tank cover.
3. Replace the dose area product measuring device.
4. Open the local service and select <Main System>-<Adjustment>-<DAP/Air Kerma> and check the accuracy of the dose area product measuring device.
   - ➪ Perform a DAP accuracy check if DAP display is configured on the monitor.
   - ➪ Perform an Air Kerma accuracy check if Air Kerma display is configured on the monitor.

Laser targeting device (SIREPHOS-side)

⚠CAUTION

Laser emissions!

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **Do not look directly into the laser beam!**

1. Remove the SIREPHOS cover. See chapter (Cover panels / p. 20).
2. Replace the laser diodes after removing the bracket and unsolder the wires.
3. Adjust the laser diodes using the adjustment device supplied with the laser targeting device.
4. Reattach the SIREPHOS cover.
5. Seal the SIREPHOS cover using sealing compound. See chapter 1.

Integrated Laser light localizer (I.I. -side)

⚠CAUTION

Laser emissions!

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **Do not look directly into the laser beam!**

1. Remove the I.I. ring at the I.I. input screen.
2. Remove the integrated I.I. laser light localizer and disconnect the small voltage plug, after removing the I.I. ring.
3. Remove the grid from the defective integrated I.I. laser light localizer and insert it at the new integrated I.I. laser light localizer .
4. Connect the voltage plug of the new integrated I.I. laser light localizer to the voltage plug of the I.I.
5. Attach the laser light localizer including the grid and the I.I. ring to the I.I. and fasten it with the screws.
6. Adjust the laser diode beams to the center point of the single tank. The I.I. should be on top, the SIREPHOS should be at the bottom, the C-arm angulation should be in the 0 degree position.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing the C-arm rollers

⚠CAUTION

Risk of crushing!

Risk of minor to medium physical injuries.

- ➪ **As soon as the C-arm is relieved, the unit tilts easily to the rear.**
- ➪ **Before the C-arm is relieved, secure the basic unit against tilting to the rear.**

Prerequisite:

- 2 persons for moving the C-arm in and out.
- Table with sufficient stability for holding the C-arm.
- Complete set of rollers (4 single rollers and 1 roller support).

Securing the basic unit against tilting

1. Push a wooden block or other stable object of sufficient height under the middle of the basic unit (1/Fig. 14 / p. 54).

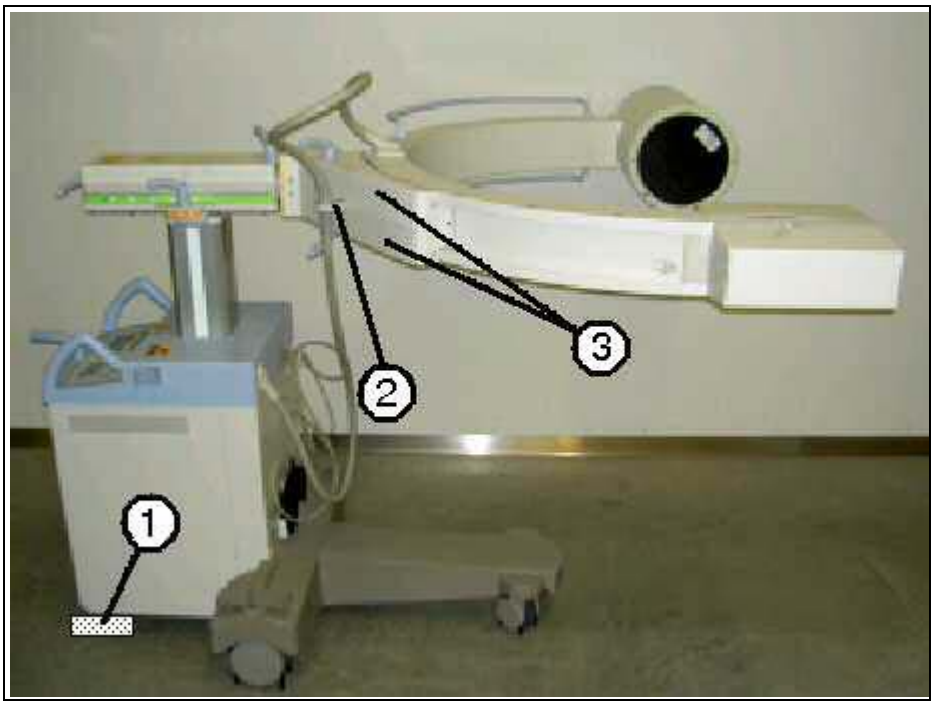

Fig. 14: Securing the basic unit

Set the C-arm and lifting column to the working position

1. The ARCADIS is plugged into the mains and switched on for a short time.
2. Move the vertical lifting column into its highest position.
3. Switch the ARCADIS system off and separate it from the mains by pulling out the mains plug.
4. Remove the SIREPHOS cover.
5. Remove the covers (3/Fig. 14 / p. 54) of the C-arm support.
6. Unscrew the cable holder on the C-arm support (2/Fig. 14 / p. 54).
7. Turn the C-arm to +90 degrees or -90 degrees; the C-arm is horizontal as shown in (Fig. 14 / p. 54).
8. Plug the system into the mains and switch it on for a short time.
9. Position the C-arm over a table with sufficient stability.
10. Move the vertical lifting column so that the C-arm including the image intensifier and SIREPHOS rest lightly on the table.
11. Switch system off and separate it from the mains. Pull out the mains plug.

Removing the SIREPHOS

1. Apply the angulation brake and the orbital brake of the C-arm.
2. Remove the end stop (rubber buffer) on the SIREPHOS side. The bolt with the mounting screws of the SIREPHOS is visible.
3. Remove all connection cables from the C-arm cable to the SIREPHOS.
4. Remove all connection cables to the collimator.
5. If a laser targeting device is present, unsolder the cables.
6. If a DIAMENTOR is present, disconnect the cable from the dose measuring chamber.
7. The image intensifier and C-arm must rest on the table.
8. One person holds the SIREPHOS, while the second person loosens the mounting screws of the SIREPHOS.
9. Remove the SIREPHOS from the table and set it on a suitable base.

Removing the C-arm

1. The C-arm can now be turned completely out of the C-arm support.
2. Make sure that the image intensifier and C-arm always remain on the table.
3. All rollers are now accessible.

Replacing the rollers and reinstalling the C-arm

1. Replace the 4 rollers for lateral guidance. To do this, remove the locking ring, replace the rollers and refit the locking ring.
2. Replace the complete roller support .
3. Then thread the C-arm between the inner and outer rollers.
4. Mount the SIREPHOS back on the C-arm using Allen screws. Be careful not to crush the cables.
5. Fasten the protective ground wire back to the SIREPHOS.
6. Reinstall all cable connections to the SIREPHOS, collimator and possibly available laser targeting device and Diamentor ionization chamber options.
7. Plug the system into the mains and switch it on for a short time.
8. Move the vertical lifting column out completely and remove the table.
9. Switch the system off and separate it from the mains. Pull out the mains plug.
10. Remove the wooden block.
11. Fasten the cable holder of the C-arm cable back to the C-arm support.

Attaching the covers

1. Once again, use sealing compound 2049716 to seal the SIREPHOS cover completely.
2. Refit the SIREPHOS cover. If necessary, apply side pressure to the SIREPHOS cover until the sealing compound hardens.
3. Refit the rubber buffer (orbital movement end stop) on the SIREPHOS side.
4. Refit the lateral covers of the C-arm support.
5. Refit the rear cover of the basic unit. Make sure the protective ground wire makes good contact.
6. Refit any other removed covers and make sure that the protective ground wires are in good contact.

Checks

1. Check the orbital movement in the vertical and horizontal angulation position of the C-arm.
2. Check the orbital movement forces in an unbraked and braked condition according to the service instructions.
3. Plug the ARCADIS system into the mains and switch it on.
4. Check the collimator settings (iris diaphragm and slot diaphragms) according to the service instructions.
5. If a cassette holder is present, check the cassette exposure collimation.
6. If a laser targeting device is present, check the function of the laser targeting device.
7. If the optional Diamentor is present, check its functioning.

8. Check the image quality according to the IQ test.
9. Perform the protective ground wire test according to TD00-000.860.01.... The protective ground wire resistance must not exceed 0.2 ohms.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing the power supply assembly

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Switch system power supply off, disconnect the power plug and disconnect all power plugs from the UPS.**

NOTE

The power supply assembly is programmed to 230V AC mains voltage. Ensure that the new power supply is programmed to the local mains voltage value and the fuses F1 and F2 are changed to the correct value, as printed in the circuit diagram of the system.

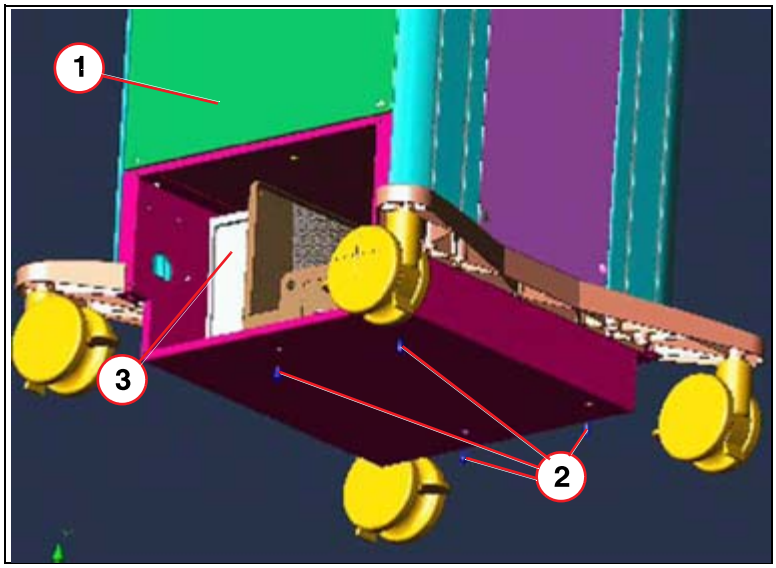

Fig. 15: Power supply

1. Switch off the system.
2. Remove the system power plug.
3. Disconnect all UPS power plugs (input and output plugs).
4. Unscrew the 4 screws from the rear cover and remove the cover (1/Fig. 15 / p. 58)
5. Unscrew the 6 screws from the lower rear cover and remove the cover (cover already removed in (Fig. 15 / p. 58)).
6. Unscrew the 4 Allen screws (2/Fig. 15 / p. 58) for the power supply component.

7. Pull the power supply component about 10cm out of the trolley.

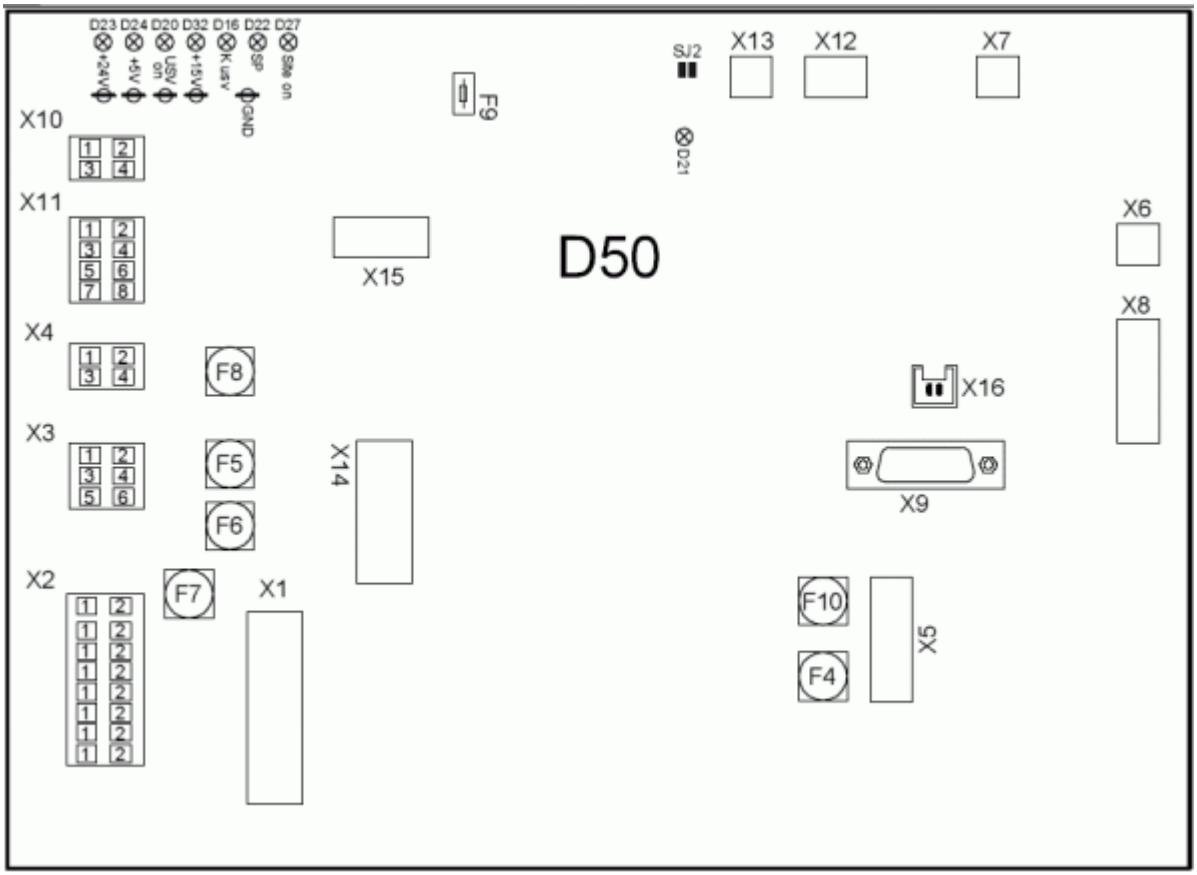

Fig. 16: D 50

8. Disconnect the power line at connector D50 X 11
   - ➪ Live Monitor - X 11.2 blue / X11.5 brown
   - ➪ Imaging System (PC) - X 11.3 blue / X11.6 brown
   - ➪ UPS output - X 11.1 blue / X 11.4 brown
9. Disconnect the power line at connector D50 X 2
   - ➪ Reference Monitor - X 2.1 blue / X 2.2 brown
   - ➪ Paper Printer (option) - X 2.1 blue / X 2.2 brown
10. Disconnect the power line at connector D50 X 4
    - ➪ UPS input - X 4.2 blue / X 4.3 brown
11. Disconnect the display unit cable at connector D50 X 3
    - ➪ X 3.1 = green / x 3.2 = red / X 3.3 = yellow / X 3.4 = black / X 3.5 = violet / X 3.6 = blue
12. Disconnect the ground wires coming from the monitor trolley and the monitor cable .
13. Unplug D50 X6, X7, X8, X9, X12 and the X13 connector.
14. Unplug the PC connectors D 66 X4 (BNC) and D66 X5 (Fig. 22 / p. 68) and pull these cables down.
15. Remove the cable clamps from the SG-cable and the power cable.

16. Disconnect and pull the SG-cable and the power cable out from the power supply assembly.
17. Remove the power supply component from the monitor trolley.
18. Program the mains voltage of the new power supply assembly (transformer T1 and T2) to the local mains voltage value.
19. Check the fuse values of the fuses F1 and F2.
    - ➪ If needed, replace them with fuses with the correct values for the programmed local mains voltage value (100V AC to 127V AC: 20A slow blow / 200V AC to 240V AC: 15A slow blow, see wiring diagram of the system).
20. Install the new power supply component in reverse order.
21. Reconnect all power plugs to the UPS.
22. Switch on the system and carry out a functional test.

Replacing the UPS

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Switch system power supply off, disconnect the power plug and disconnect all power plugs from the UPS.**

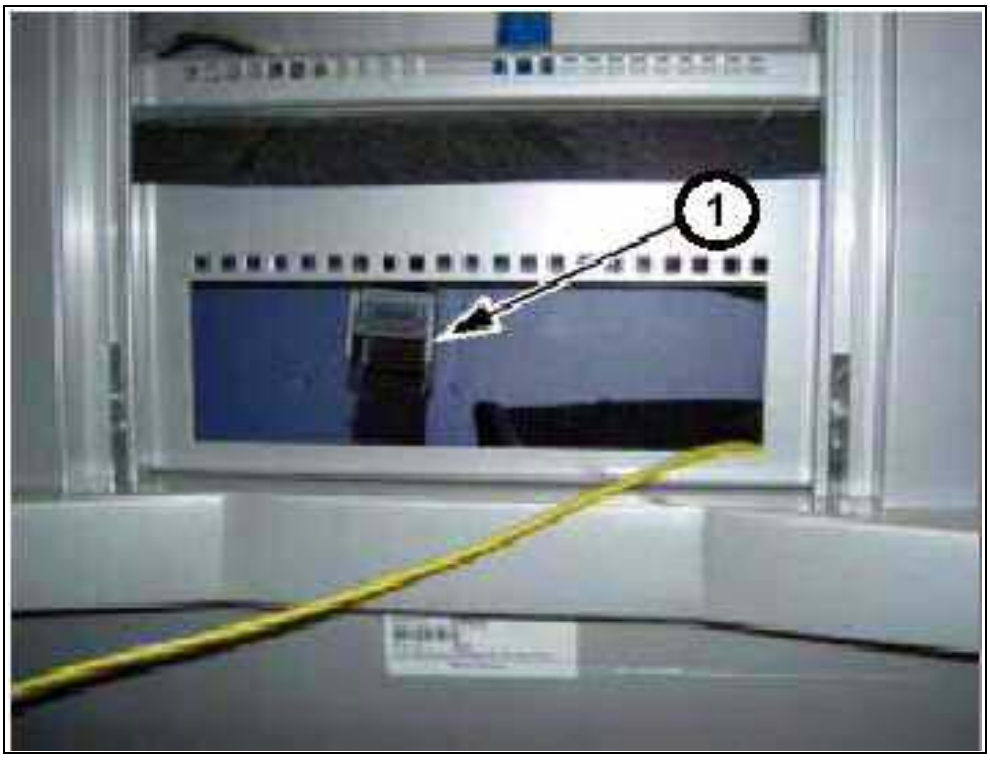

Fig. 17: Replacing the UPS_2

1. Remove the rear cover from the monitor trolley.
2. Disconnect all power plugs from the UPS.
3. Loosen the tension band (1/Fig. 17 / p. 61) and remove the UPS from the monitor trolley. Side covering was already removed in (Fig. 17 / p. 61).
4. Switch off the UPS by pressing the power switch.

NOTE

UPS MGE type 850: To switch the UPS off or on, the power switch needs to be pressed for > 2 seconds.

5. Switch on the new UPS at its power switch.
6. Install the new UPS component in reverse order.
7. Switch on the system and carry out a functional test.

NOTE

For correct functionality of the UPS, the new battery should be charged for approx. 8 hours. If possible and after all service tasks are performed, switch the system off, but leave the monitor trolley connected to the mains voltage wall socket. As long as the power plug of the monitor trolley is plugged in the mains voltage wall socket, the UPS battery will be charged.

Replacing the UPS battery

⚠WARNING

Electrical voltage!

See chapter 1, Safety Information.

➪ **Switch system power supply off, disconnect the power plug and disconnect all power plugs from the UPS.**

⚠CAUTION

Risk of burns and destroying the battery component due to possible high short-circuit current!

Wearing metal objects like rings, watches bracelets and using tools with uninsulated handles during procedures can lead to a short-circuit of the battery contacts. This can destroy the battery component and can heat up the metal objects, causing a short-circuit at very high temperatures.

➪ **Before servicing the battery components, remove watches, rings, bracelets and all other metal objects from the hands and arms, Use tools with insulated handles.**

UPS MGE Type 800

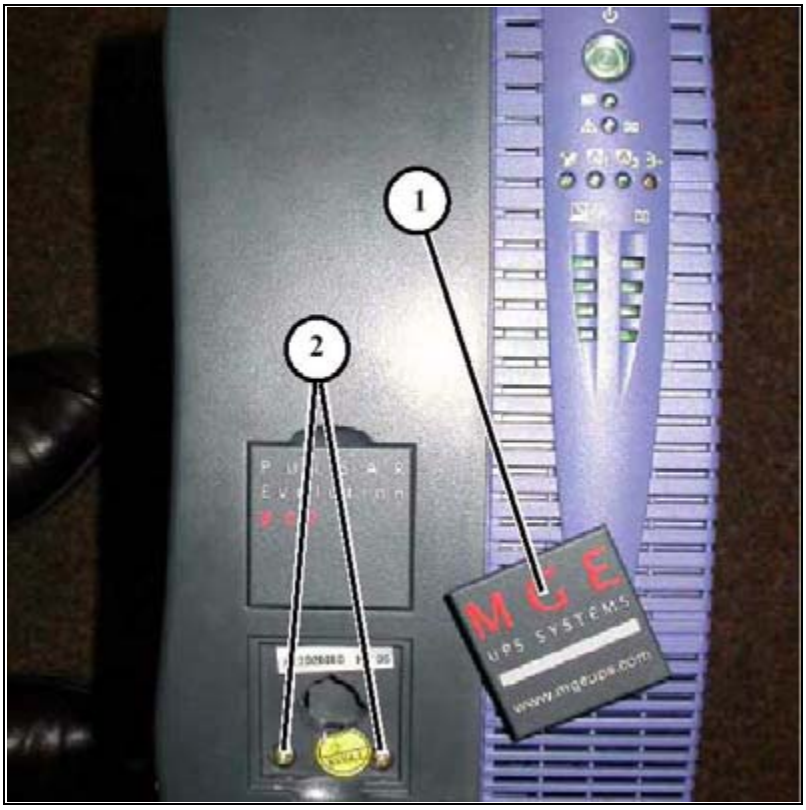

Fig. 18: Replacing the UPS_battery_1

Fig. 19: Replacing the UPS_battery_2

1. Disconnect all power plugs from the UPS.
2. Remove the UPS from the monitor trolley.
3. Switch off the UPS by pressing the power switch on the UPS.
4. Remove the plastic cover “MGE UPS Systems”” (1/Fig. 18 / p. 63) from the UPS.
5. Unscrew the 2 slotted grub screws (2/Fig. 18 / p. 63) from the UPS and remove the front cover.
6. Disconnect the connector (1/Fig. 19 / p. 64) and pull the battery out of the slot.
7. Insert the new battery into the UPS.
8. Connect the battery connector in front of the battery.

NOTE

Make sure that the battery connector contacts are not bent when plugged in! Check the contact (1/Fig. 19 / p. 64) if the system does not switch on .

9. Install the UPS front cover and fasten it with the screws.
10. Install the UPS plastic cover “MGE UPS Systems”.
11. Switch on the UPS by pressing the power switch on the UPS.
12. Insert the UPS component in reverse order into the monitor trolley.

NOTE	**For correct functionality of the UPS, the new battery should be charged for approx. 8 hours. If possible and after all service tasks are performed, switch the system off, but leave the monitor trolley connected to the mains voltage wall socket. As long as the power plug of the monitor trolley is plugged in the mains voltage wall socket, the UPS battery will be charged.**

MGE UPS Type 850

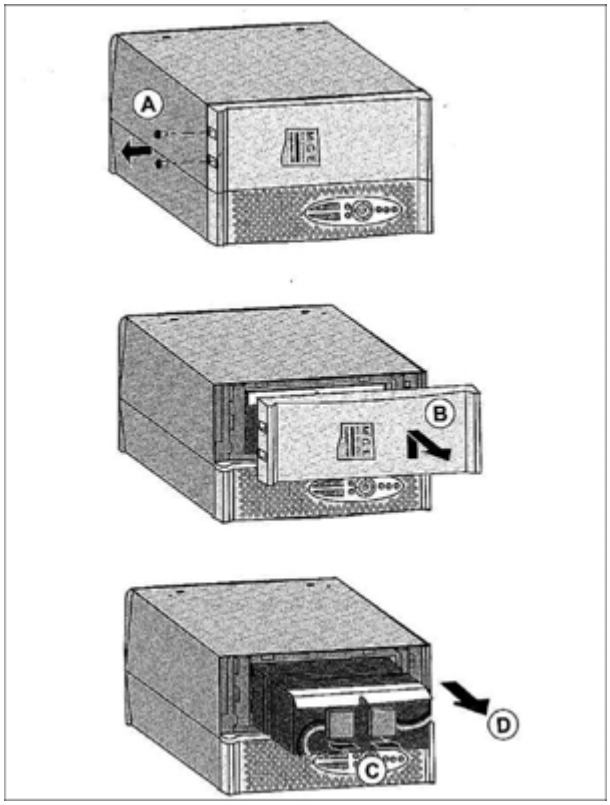

Fig. 20: UPS MGE 850 Battery change

1. Disconnect all power plugs from the UPS.
2. Remove the UPS from the monitor trolley.
3. Switch off the UPS by pressing the power switch at the UPS for more than 2 seconds.
4. Lay the UPS sideward, as shown in (Fig. 20 / p. 65).
5. Remove the 2 screws on the bottom of the UPS, as shown in A, (Fig. 20 / p. 65).
6. Lift up and pull up the front cover, as shown in B, (Fig. 20 / p. 65).
7. Disconnect the battery connector in front of the battery and pull the battery out of the slot.
8. Insert the new battery into the UPS.
9. Connect the battery connector in front of the battery.

NOTE

Make sure that the battery connector contacts are not bent when plugged in! Check the contact (1/Fig. 19 / p. 64) if the system does not switch on .

10. Install the UPS front cover and fasten it with the screws.
11. Switch on the UPS by pressing the power switch on the UPS for more than 2 seconds.
12. Insert the UPS component in reverse order into the monitor trolley.

NOTE

For correct functionality of the UPS, the new battery should be charged for approx. 8 hours. If possible and after all service tasks are performed, switch the system off, but leave the monitor trolley connected to the mains voltage wall socket. As long as the power plug of the monitor trolley is plugged in the mains voltage wall socket, the UPS battery will be charged.

Replacing the keyboard

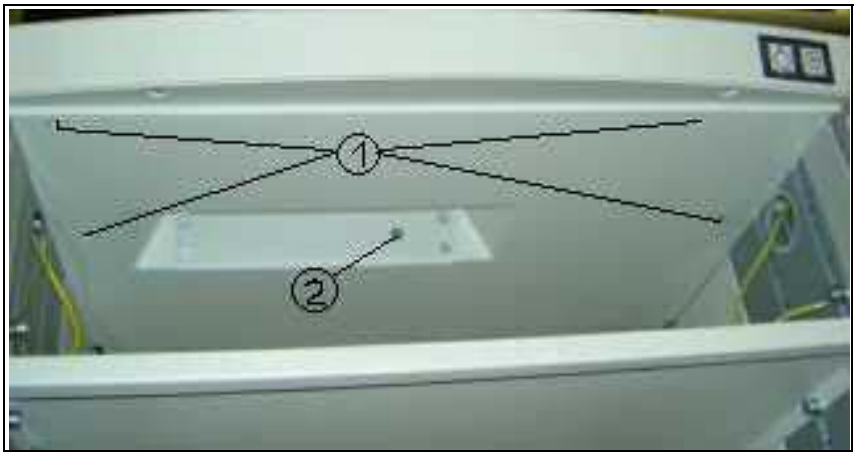

Fig. 21: Replacing the keyboard_3

1. Remove the 4 screws (1/Fig. 21 / p. 67).
2. Lift the keyboard upward out of the monitor trolley.
3. Unplug the keyboard connectors.
4. Install the new keyboard in reverse order.
5. Carry out a functional test.

Replacing the PC

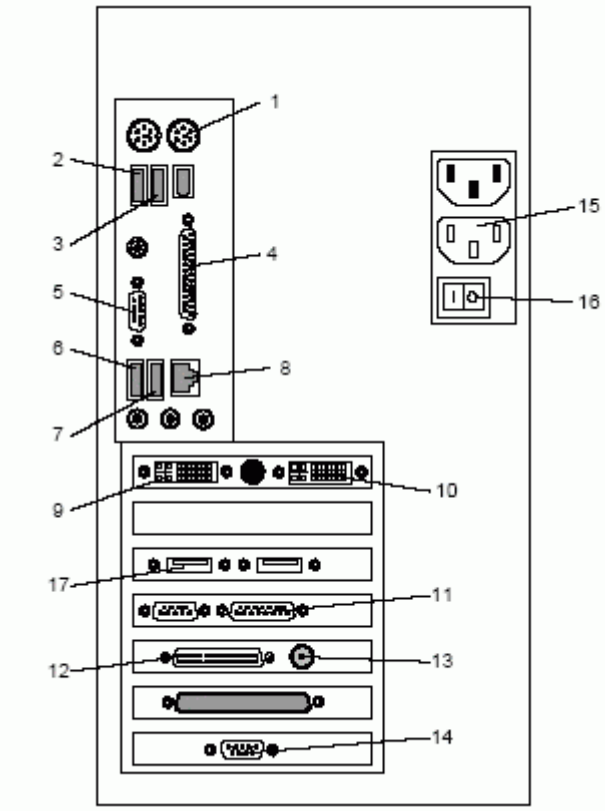

Fig. 22: PC rear

Connection

1 UPS control
2 Keyboard
3 Mouse
4 Printer connect parallel
5 COM 1
6 Dongle
7 Printer connect USB
8 LAN connector
9 Monitor B
10 Monitor A
11 M50 D20 X9
12 D66 X5
13 D66 X4 (Gigalink)
14 Adapter plug COM1
15 Net plug (only M420 / 430)
16 On/off switch (only M420/430)
17 CAN converter (option)

1. Save patient data and create a backup if possible.
2. Switch off the system and remove the system power plug.
3. Unscrew the 6 screws from the rear cover (1/Fig. 15 / p. 58) and remove the cover.
4. Unplug all cable connections from the PC (Fig. 22 / p. 68).
5. Loosen the tension belt from the PC
6. Remove the old PC and insert the new PC.
7. Reconnect all PC plugs (Fig. 22 / p. 68).

NOTE

All plugs must be connected at shown in the figure above for the software installation to be successful (see (Fig. 22 / p. 68)).

8. Switch on the system and install the software according to the "System Software Installation" instructions.
9. Carry out a functional test and an IQ Quick test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing PC covers

Opening the casing

PC M420 and 430

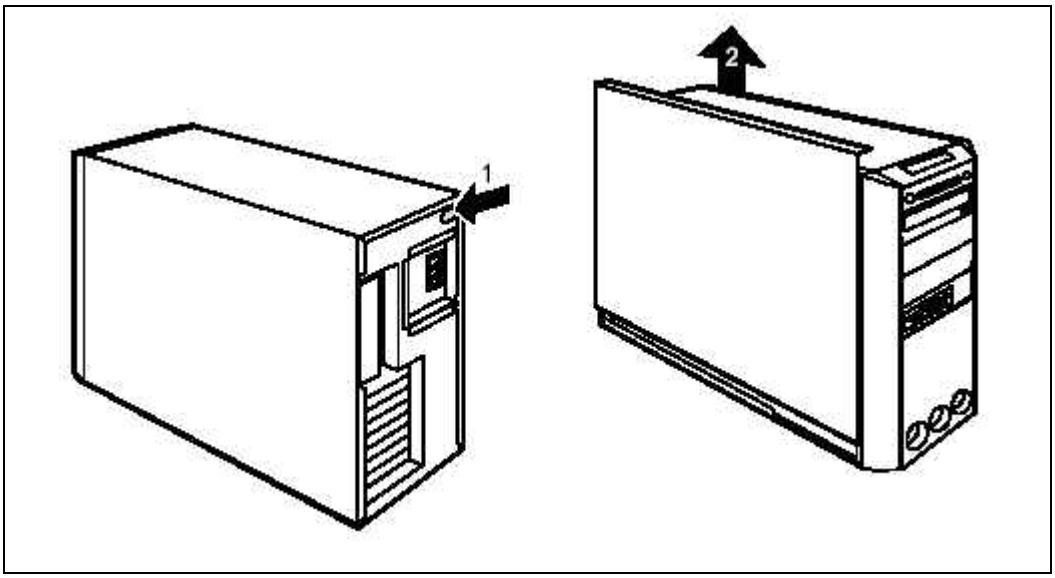

Fig. 23: Remove PC covers

1. Switch off the system.
2. Pull the power plug out of the mains outlet.
3. Replace the PC from monitor trolley (Replacing the PC / p. 68).
4. Press the green unlocking button on the rear of the casing (1/Fig. 23 / p. 70).
5. Hold the green unlocking button depressed and slide the casing side cover upwards in the direction of the arrow (2/Fig. 23 / p. 70).
6. Pull the side cover out of the casing.

PC M450

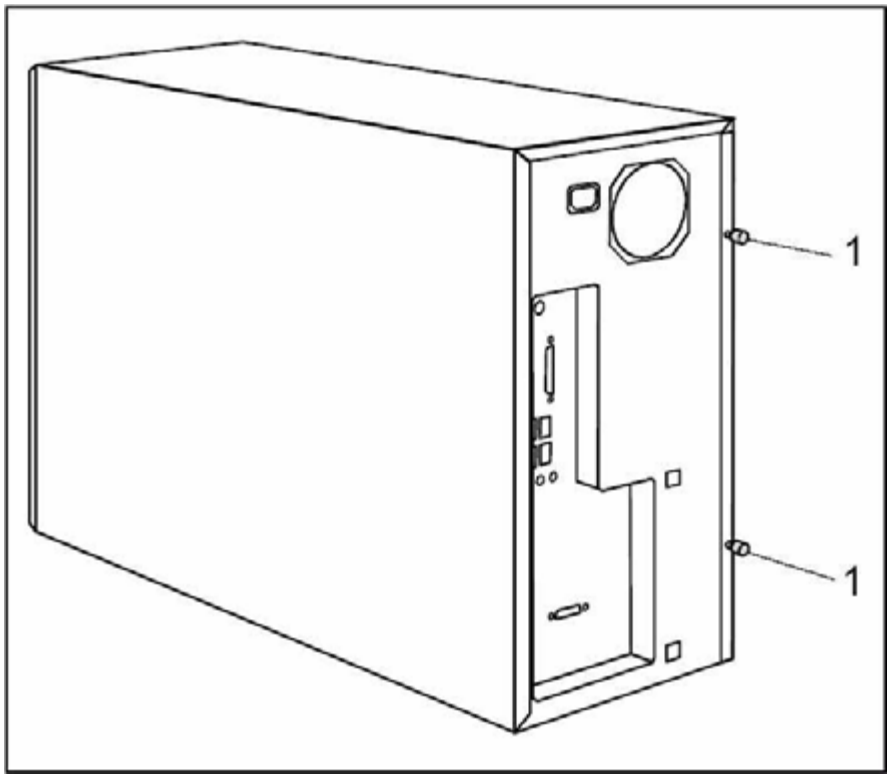

*Fig. 24: Remove PC cover_a M450_*

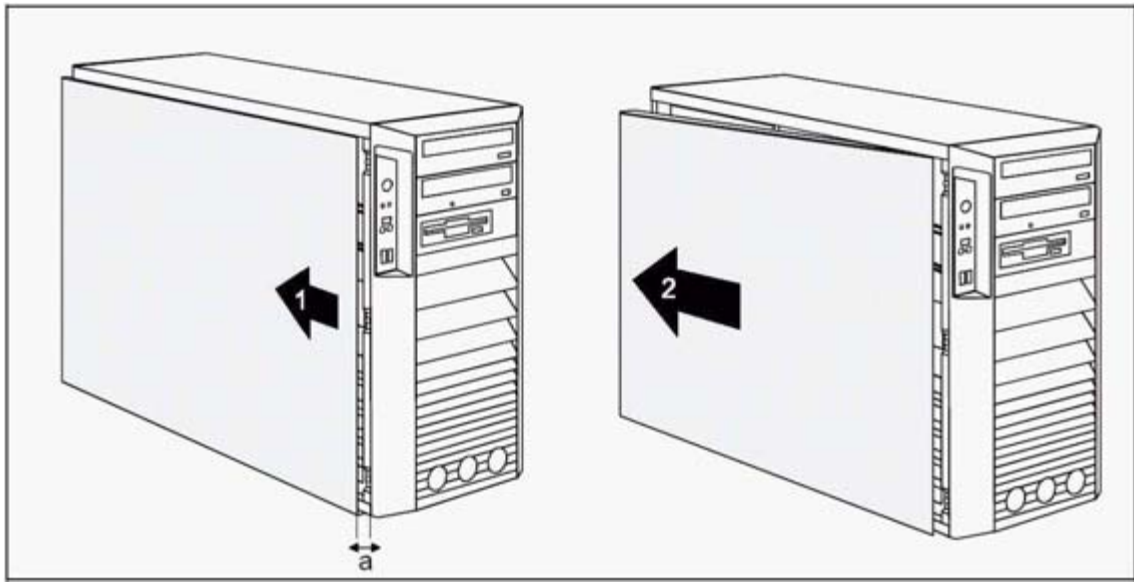

*Fig. 25: Remove PC cover_b M450_*

1. Switch off the system.
2. Pull the power plug out of the power outlet.
3. Replace the PC from monitor trolley (Replacing the PC / p. 68).
4. Unscrew the two knurled screws (1/Fig. 24 / p. 71) on the back of the casing.
5. Slide the side cover approximately 2cm (a/Fig. 25 / p. 71) in the direction of the arrow (1/Fig. 25 / p. 71), until it reaches the stop.

6. Pull the side cover in the direction of the arrow (2/Fig. 25 / p. 71) of the casing.

Removing the front panel

PC M420 and M430

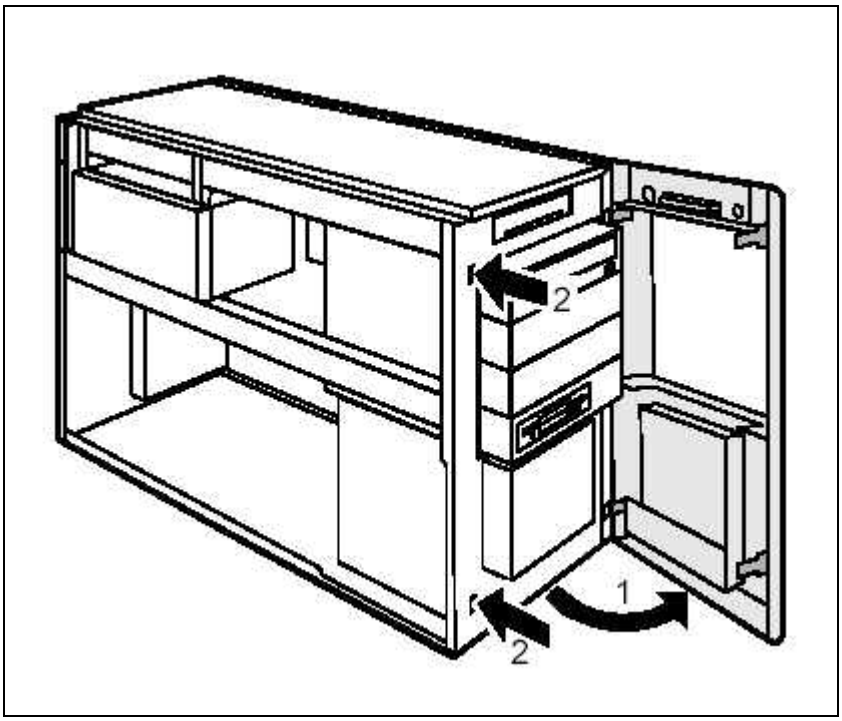

Fig. 26: Removing the front panel

1. Replace the PC from monitor trolley (Replacing the PC / p. 68).
2. Open the casing (Opening the casing / p. 70).
3. Detach the unlocking lever (2/Fig. 26 / p. 72) and open the front panel (1/Fig. 26 / p. 72).
4. Detach the plastic hook from the front panel of the casing and carefully remove the front panel. If you pull too hard, you may loosen or damage the LCD cable.
5. The TCD cable is long enough so that you can carefully place it to one side with the front panel. You do not need to unplug the cable before removing the front panel.

PC M450

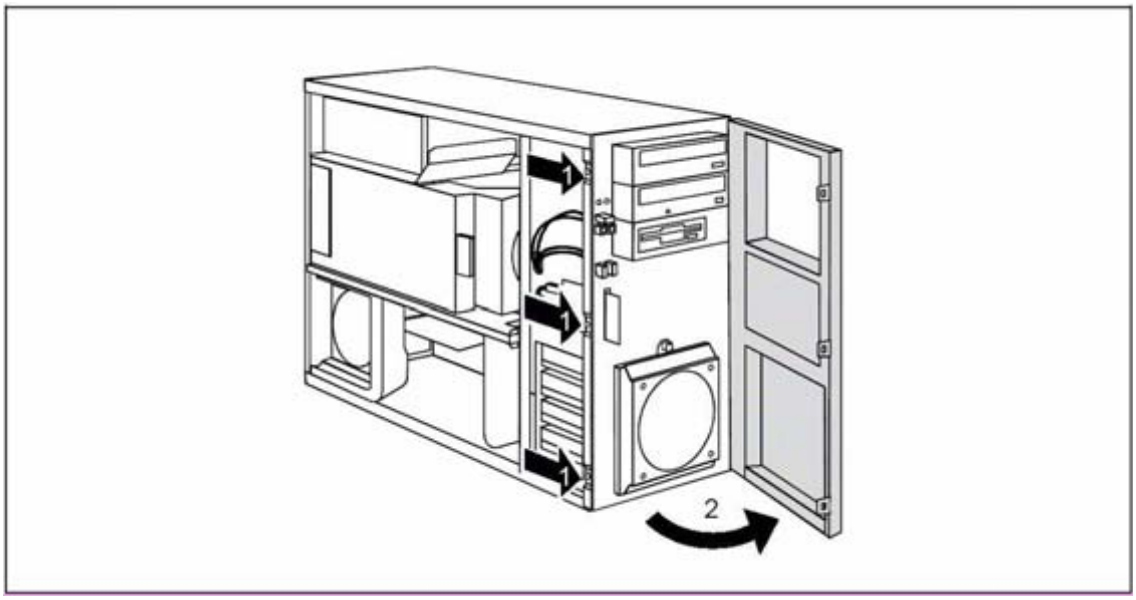

*Fig. 27: Opening the front panel M450_*

1. Replace the PC from monitor trolley (Replacing the PC / p. 68).
2. Open the casing (Opening the casing / p. 70).
3. Detach the three locking tabs on the left side of the front panel (1/Fig. 27 / p. 73).
4. Fold open the front in the direction of the arrow (2/Fig. 27 / p. 73).
5. If necessary, detach the pivot axle on the right-hand side of the front panel from the casing and carefully remove the front panel.

Replacing the drive

PC M420 and M430

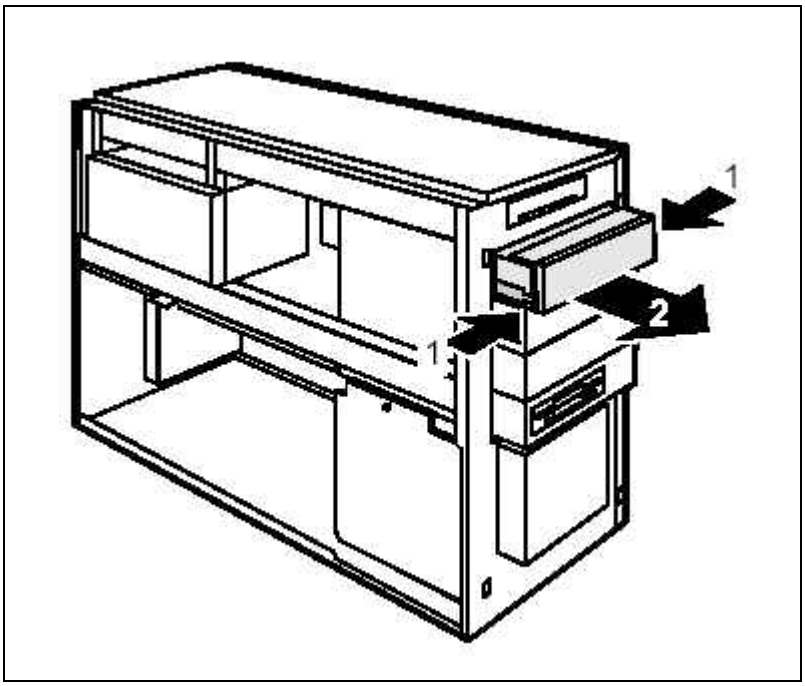

Fig. 28: Replacing the drive

1. Replace the PC from monitor trolley (Replacing the PC / p. 68).
2. Open the casing (Opening the casing / p. 70).
3. Remove the front (Removing the front panel / p. 72).
4. Disconnect the data and the power supply connectors from the drive.
5. Press the rails (1/Fig. 28 / p. 74) together and pull the drive out of the casing (2/Fig. 28 / p. 74).
6. Push the new drive into the casing until the rails engage.
7. Plug the data and the power supply connectors into the drive. Make sure the polarity is correct.
8. Attach the front panel in reverse order.

9. Close the casing in reverse order.
10. Reinstall the PC in reverse order and reconnect the PC plugs (see (Fig. 22 / p. 68)).
11. Carry out a functional test.

PC M450

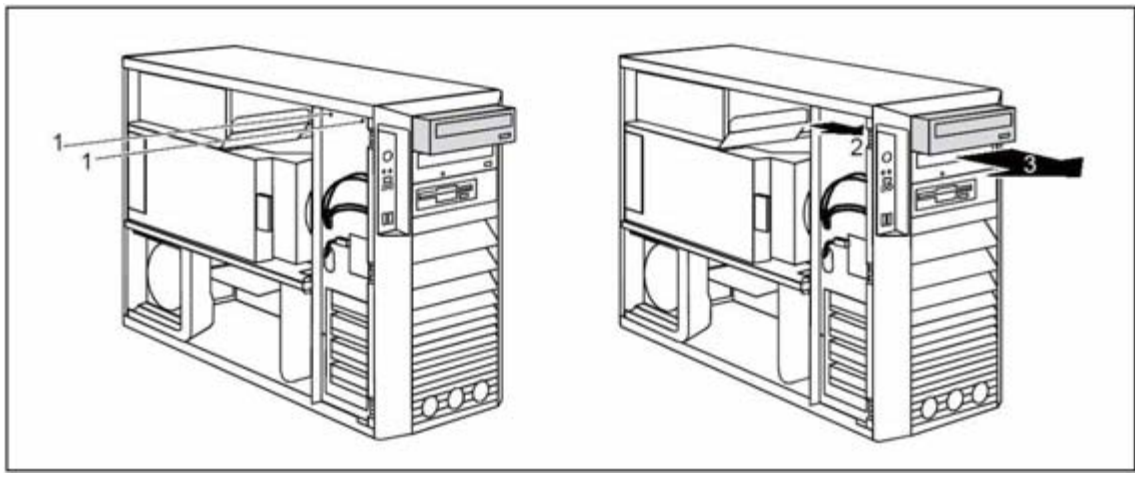

*Fig. 29: Replacing the drive M450_*

1. Replace the PC from monitor trolley (Replacing the PC / p. 68).
2. Open the casing (Opening the casing / p. 70).
3. Remove the front (Removing the front panel / p. 72).
4. Disconnect the data and the power supply connectors from the drive.
5. Loosen the screws (1/Fig. 29 / p. 75).
6. Slide the drive out of the bay in the direction of the arrow (2/Fig. 29 / p. 75) from behind. The drive now jumps out slightly from the casing.
7. Slide the drive out of the casing (3/Fig. 29 / p. 75).
8. Push the new drive into the casing until the rails engage.
9. Plug the data and the power supply connectors into the drive. Make sure the polarity is correct.
10. Attach the front panel in reverse order.
11. Close the casing in reverse order.
12. Reinstall the PC in reverse order and reconnect the PC plugs (see (Fig. 22 / p. 68)).
13. Carry out a functional test.

Replacing the lithium battery

Prerequisite: The software installation CD/DVD for the system (includes BIOS installation) must be available.

PC M420 and M430

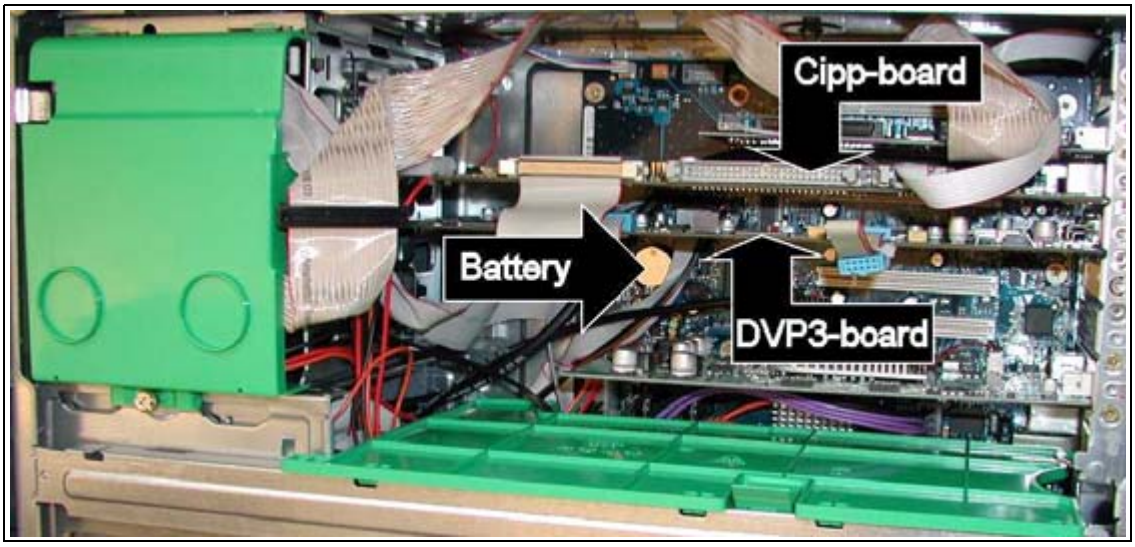

Fig. 30: Replacing the lithium battery_1

PC M450

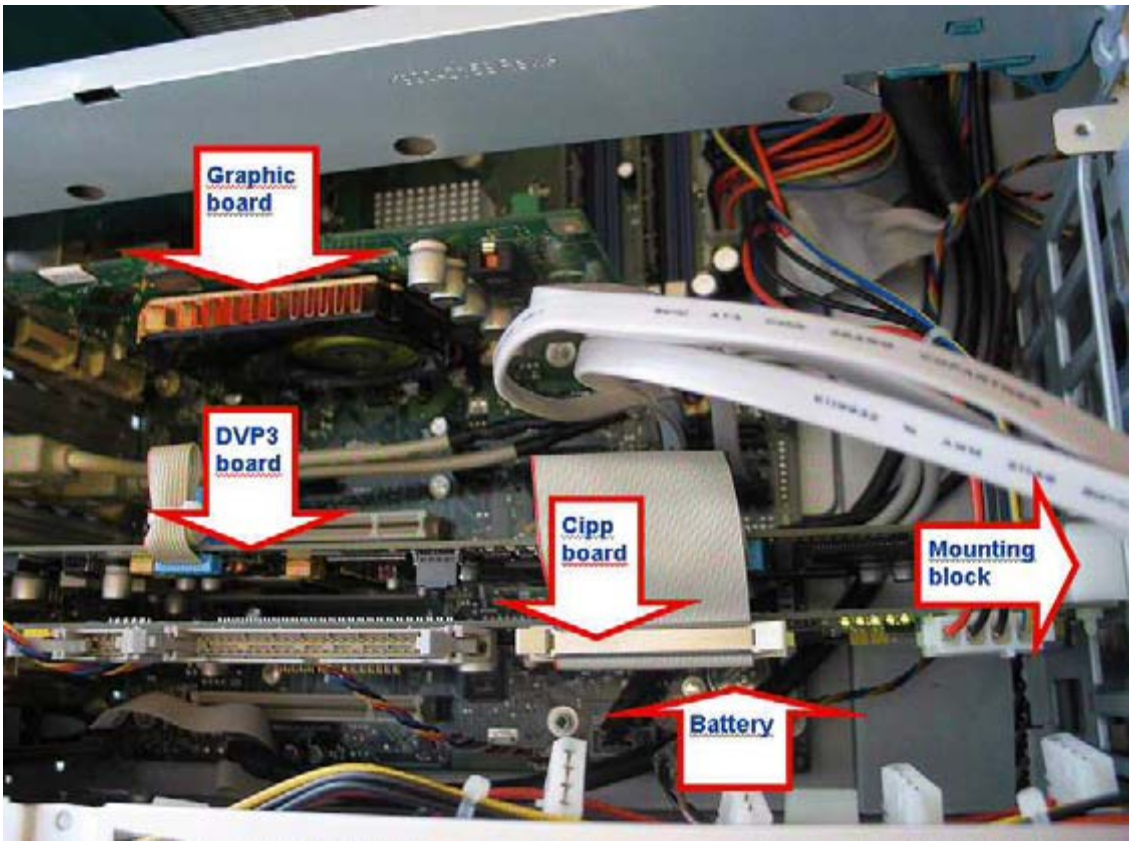

*Fig. 31: Components M450_*

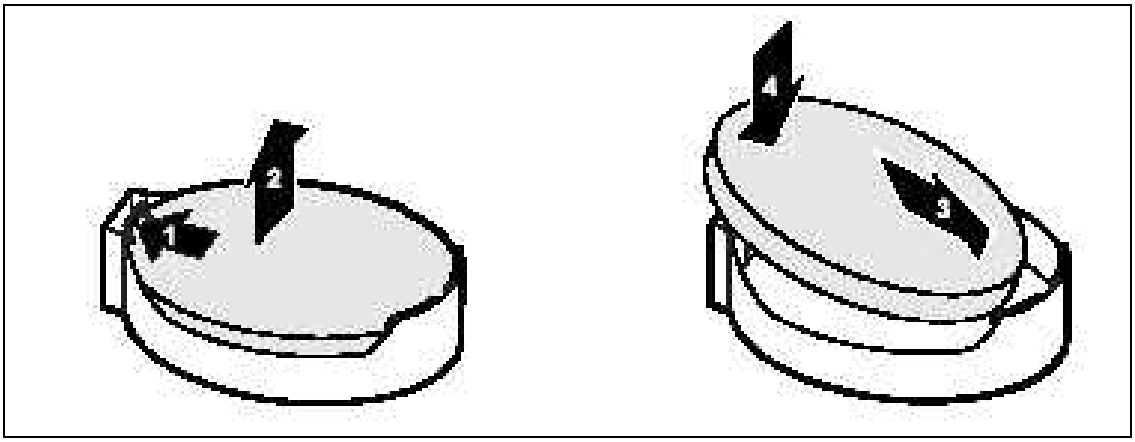

Fig. 32: Replacing the lithium battery

NOTE

In order to permanently save the system information, a lithium battery is installed to provide the CMOS memory with current. An appropriate error message notifies the user when the charge is too low or the battery is empty. The lithium battery must be replaced.

Incorrect replacement of the lithium battery may lead to a risk of explosion!

The lithium battery may be replaced only by an identical battery or a type recommended by the manufacturer.

Make sure that you insert the battery correctly. The plus pole must be on top!

Do not touch the minus pole of the battery with your finger. Use gloves or a cotton cloth to insert the battery.

1. Replace the PC from monitor trolley (Replacing the PC / p. 68).
2. Open the casing (Opening the casing / p. 70).
3. Press the locking lug in the direction of the arrow (1/Fig. 32 / p. 77); the battery jumps slightly out of the holder (2/Fig. 32 / p. 77).

4. Remove the battery M420/M430 (Fig. 30 / p. 76) or M450 (Fig. 31 / p. 77) and follow the "Disposal Instructions" for disposing of the old battery.
5. Push the new lithium battery of the identical type into the holder (3/Fig. 32 / p. 77) and press it downward until it engages (4/Fig. 32 / p. 77).
6. Reinstall the casing in reverse order.
7. Reinstall the PC in reverse order and reconnect the PC plugs (see (Fig. 22 / p. 68)).

Restoring BIOS settings (necessary after battery replacement)

NOTE

When the battery is empty, the BIOS is set to default and the first boot device is the CD-ROM drive.

In addition to activating the system on/off switch, the following may be necessary ->

- Turn off the PC via the power switch at the rear panel of the PC.

- Turn on the PC via the rear power switch and press the push button on the front panel of the PC.

- If the system is unintentionally switched off during BIOS installation, it may be necessary to press the reset key (2/Fig. 21 / p. 67) with a pin shaped object.

NOTE

At this time a restore of the BIOS settings is only possible together with the complete software installation procedure.

--> Perform software installation according to instruction SPR2-310.816.02...

Replacing a PCI board PC M420 and M430 (e. g. CIPP board)

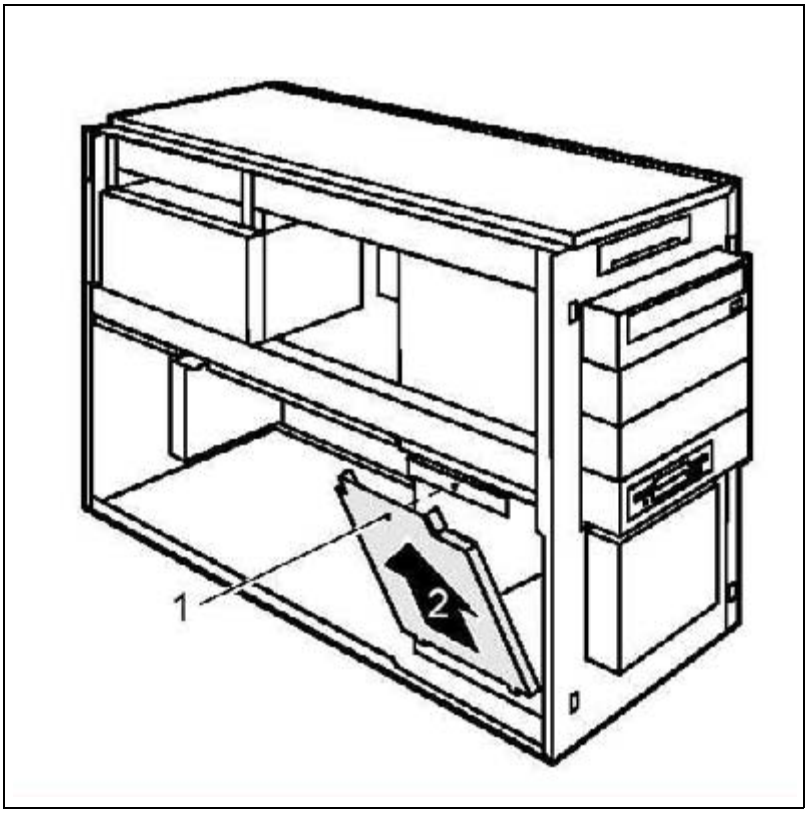

Fig. 33: Replacing a PCI board_1

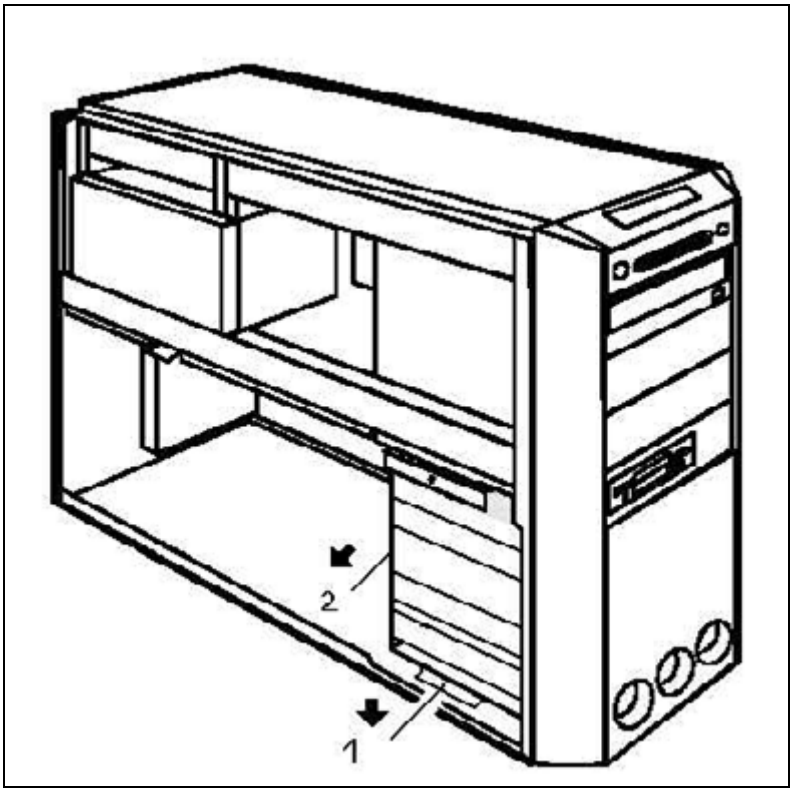

Fig. 34: Replacing a PCI board_2

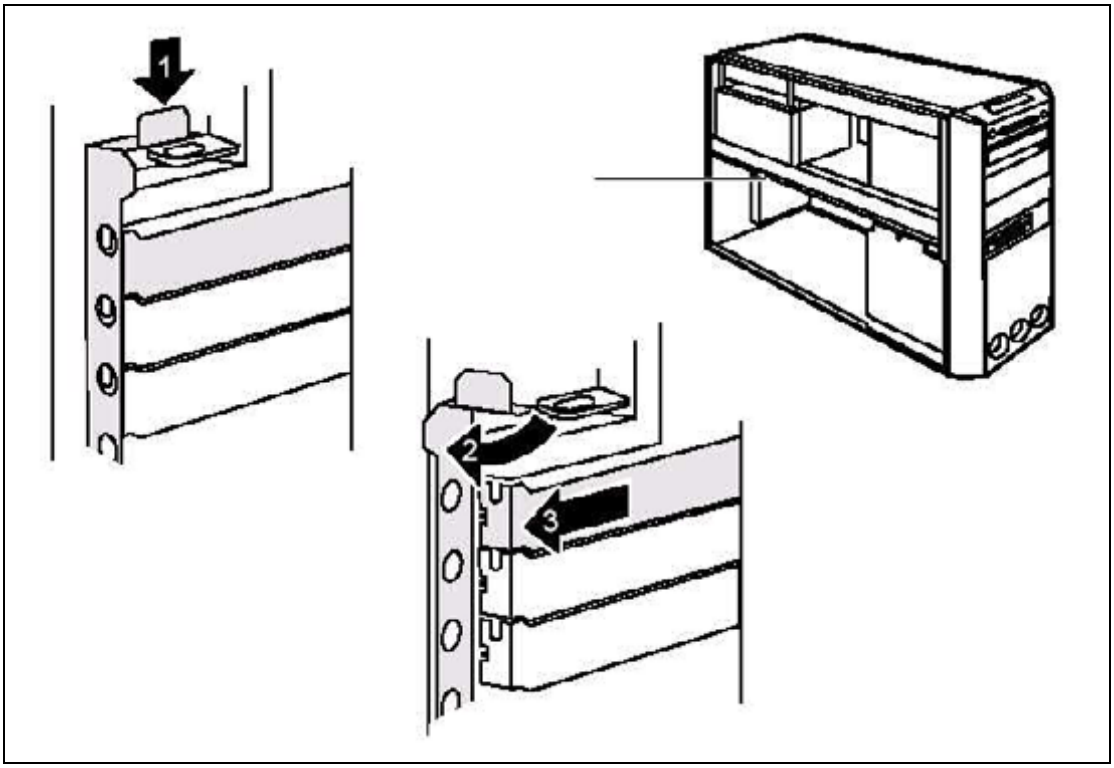

Fig. 35: Replacing a PCI board_3

NOTE

Work steps 1 through 6 are only necessary for a long design of a PCI board (e.g. CIPP board) (see (Fig. 30 / p. 76)

See ARCADIS spare parts list for which boards are released for field exchange.

1. Replace the PC from monitor trolley (Replacing the PC / p. 68).
2. Open the casing (Opening the casing / p. 70).
3. Loosen the screw (1/Fig. 33 / p. 80).
4. Fold out the cover (2/Fig. 33 / p. 80).
5. Disconnect the data and power supply cables to the hard disk drive.
6. Press the locking bar (1/Fig. 34 / p. 81) downward and pull the hard drive casing (2/Fig. 34 / p. 81) out of the PC.
7. Press the unlocking mechanism (1/Fig. 35 / p. 81) downward and open the locking rail (2/Fig. 35 / p. 81). The word "PRESS" is embossed on the unlocking mechanism.
8. Remove the locking screws from the relevant slot.
9. Disconnect the connectors from the PCI board.

10. Remove the board from the slot (3/Fig. 35 / p. 81).
11. Take the new board out of its packaging and install it in reverse order.
12. Reinstall the casing in reverse order.
13. Reinstall the PC in reverse order and reconnect the PC plugs (see (Fig. 22 / p. 68)).
14. Carry out a functional test and an IQ Quick test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing a PCI board PC M450 (e. g. CIPP board)

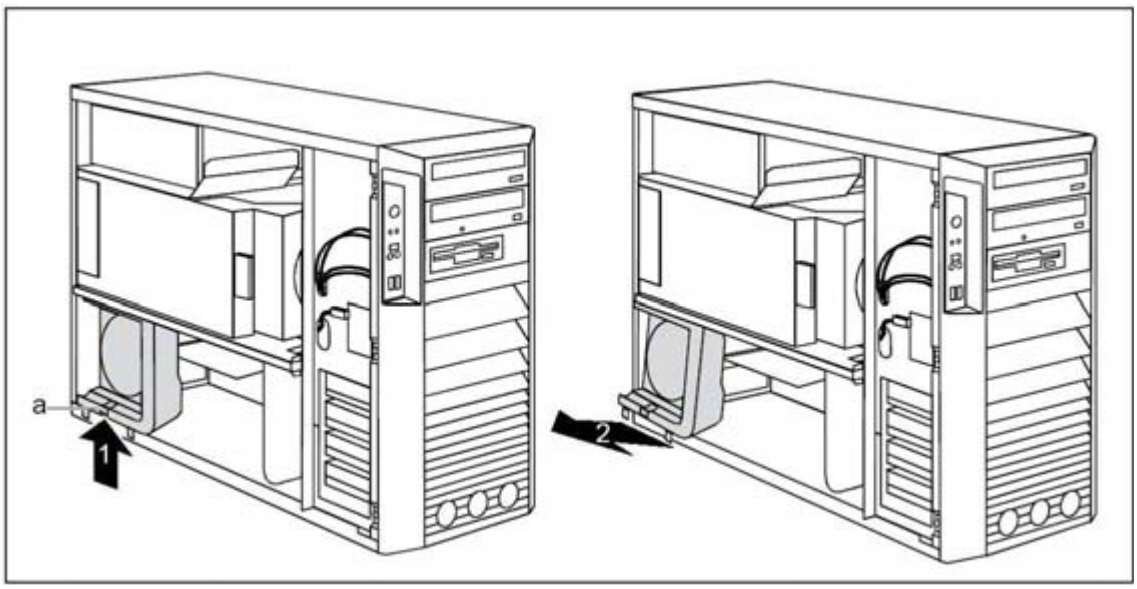

*Fig. 36: Removing the side fan M450_*

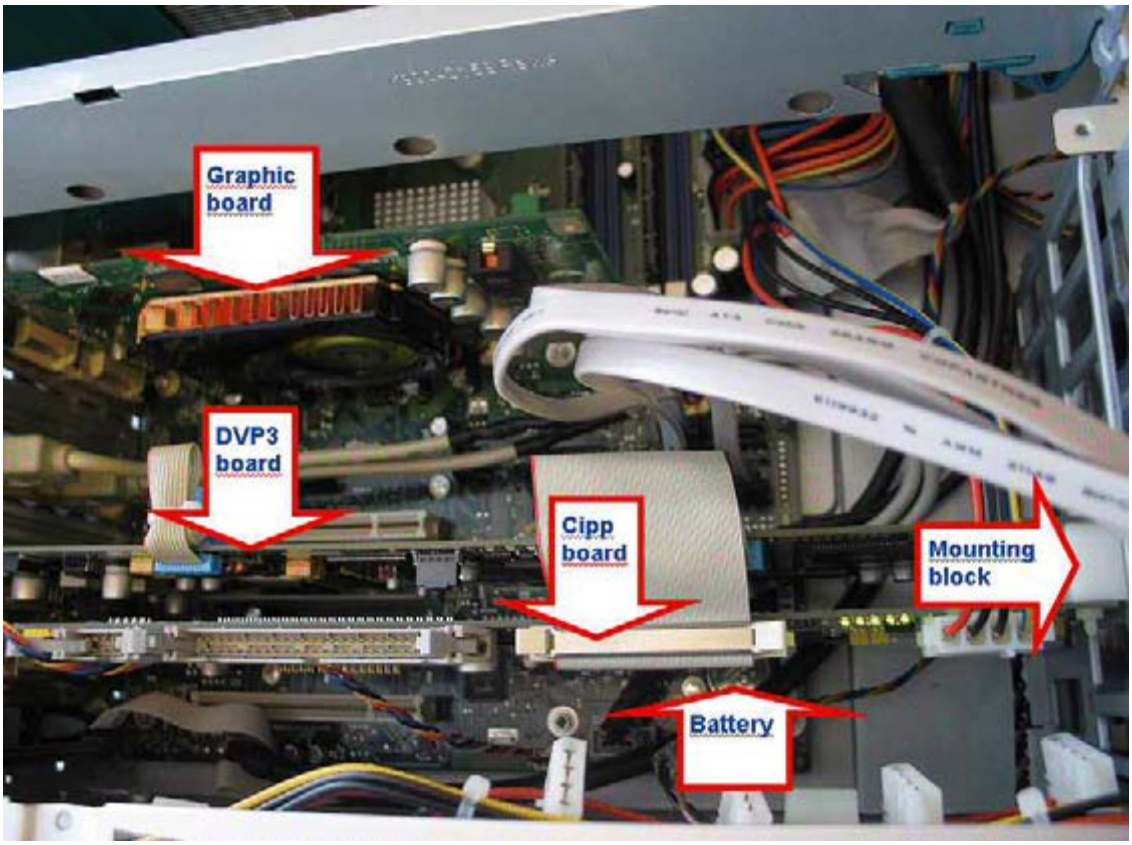

*Fig. 37: Components M450_*

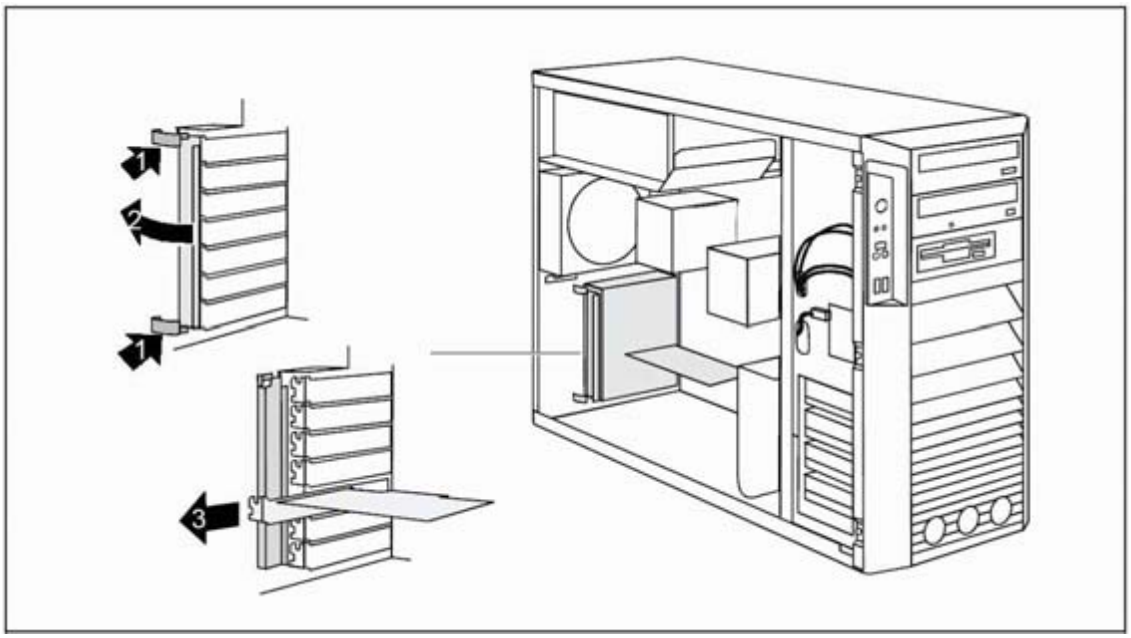

*Fig. 38: Replacing a PCI board M450_*

1. Replace the PC from monitor trolley (Replacing the PC / p. 68).
2. Open the casing (Opening the casing / p. 70).
3. Release the side fan by pressing the locking hook ((a/Fig. 36 / p. 83) in the direction of the arrow (1/Fig. 36 / p. 83).
4. Pull the bottom edge of the side fan in the direction of the arrow (2/Fig. 36 / p. 83) out of the casing.
5. Disconnect the cable of the fan from the main board and remove the side fan.
6. Remove the mounting block (mounting block/Fig. 37 / p. 83)
7. Press on the clips (1/Fig. 38 / p. 84) in the direction of the arrow and unhook them from the casing rear panel.
8. Fold open the locking rail in the direction of the arrow (2/Fig. 38 / p. 84).
9. Disconnect the connectors from the PCI board.
10. Remove the board from the slot (3/Fig. 38 / p. 84)
11. Take the new board out of its packaging and install it in reverse order.
12. Reinstall the casing in reverse order (Fig. 23 / p. 70).
13. Reinstall the PC in reverse order and reconnect the PC plugs (see (Fig. 22 / p. 68)).
14. Carry out a functional test and an IQ Quick test.

⚠WARNING

When these service tasks have been performed, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Replacing or installing a double USB slot PC M420 and M430 (optional for CAN converter)

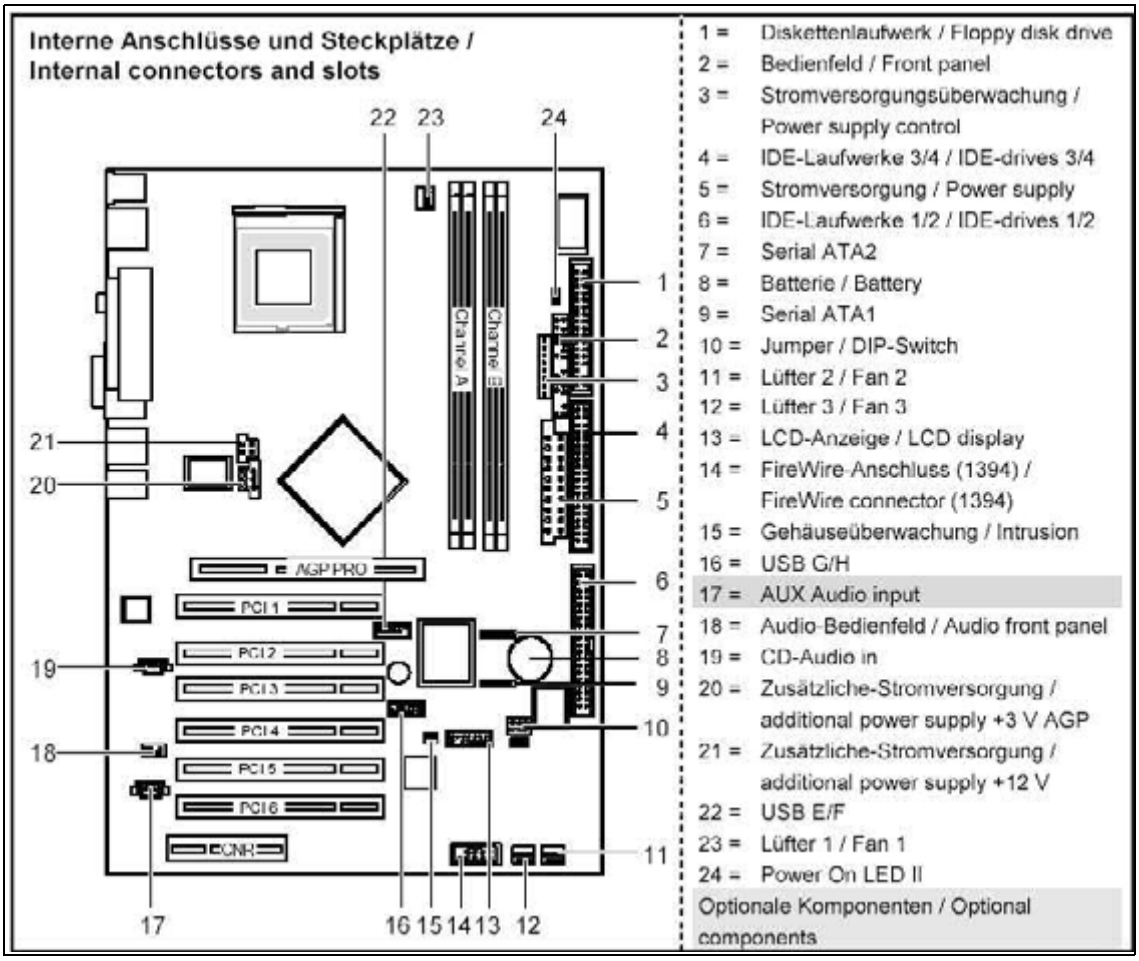

Fig. 39: Replacing or installing a double USB slot_1

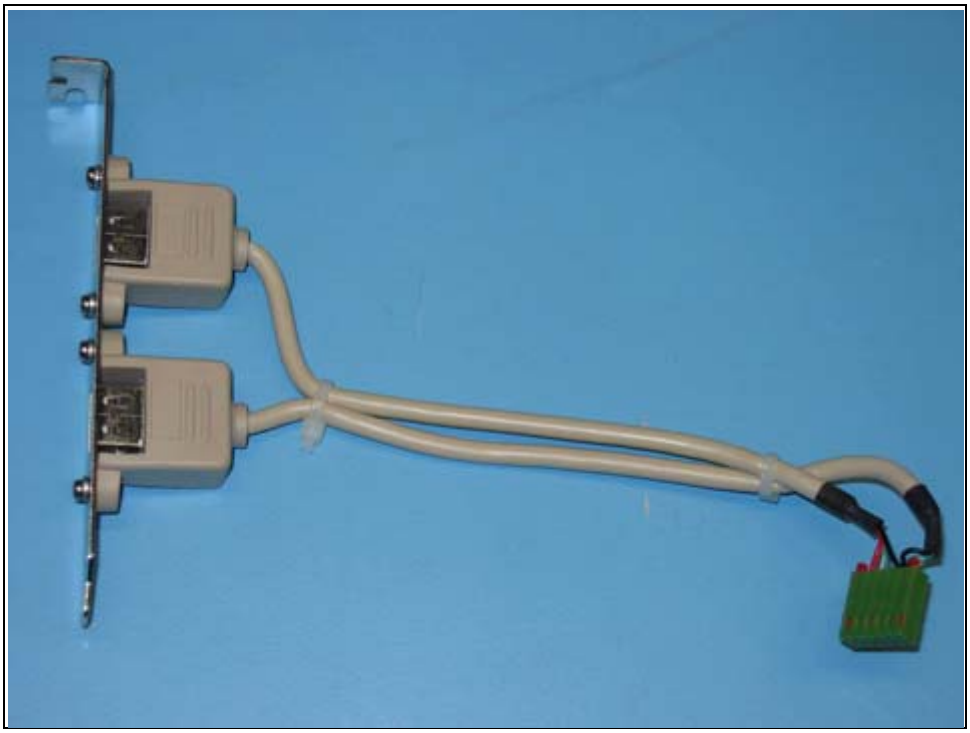

Fig. 40: Replacing or installing a double USB slot_2

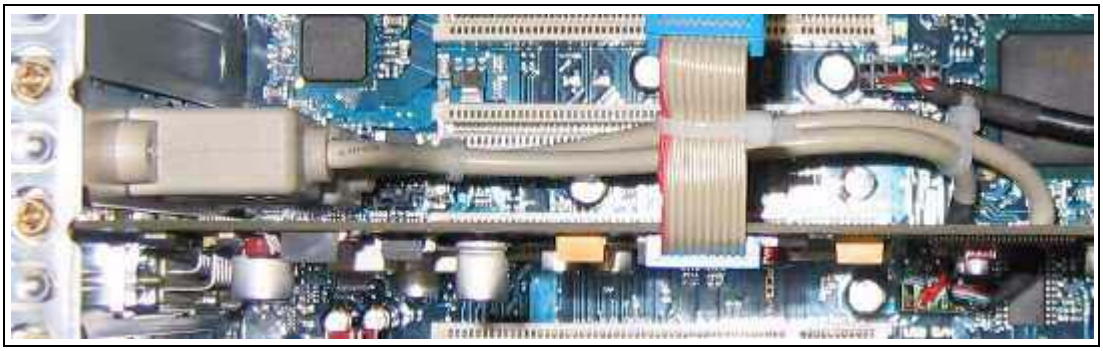

Fig. 41: Replacing or installing a double USB slot_3

1. Open the casing (Opening the casing / p. 70).
2. Press the unlocking mechanism (1/Fig. 35 / p. 81) downward and open the locking rail (2/Fig. 35 / p. 81). The word "PRESS" is embossed on the unlocking mechanism. .

NOTE	**Slot 3 should be used for the double USB assembly.**

3. Replace the DVP3 board (Fig. 30 / p. 76) according to (Replacing a PCI board PC M420 and M430 (e. g. CIPP board) / p. 80).
4. Disconnect the connector USB G/H (16/Fig. 39 / p. 86) from the main board (Fig. 39 / p. 86).
5. Reinstall the double USB connector in the slot assembly.
6. Position and connect the USB cable as shown in (Fig. 41 / p. 87).

NOTE

The cable position must be as shown in Fig. (Fig. 40 / p. 87) and Fig. (Fig. 41 / p. 87).

NOTE

Make sure that the distance between the graphic board fan and the USB cable is fixed.

7. Reinstall the DVP3 board in reverse order.
8. Reinstall the casing in reverse order (Fig. 23 / p. 70).
9. Reinstall the PC in reverse order and reconnect the PC plugs (see (Fig. 22 / p. 68)).
10. Carry out a functional test.

Monitor trolley voltages

Secondary voltages for the line voltage; table 1

Voltage for	Test point	Voltage	Comment
Generator	X3.1 -- X3.2	200 V ~ to 215 V ~	To main system
Generator	X3.5 -- X3.6	230 V ~ to 246 V ~	To main system
ASPIA PC, live monitor	X11.1 -- x11.4	230 V ~ to 246 V ~	From UPS output
Reference monitor, Paper printer	X2.1 -- X2.2	230 V ~ to 246 V ~	Paper printer = option
UPS input	X4.2 -- X4.3	230 V ~ to 246 V ~	Supply voltage

Main system voltages

Operating voltages; table 2.

Voltage	Tolerance	Test point	Potentiometer	LED
+5V	+ 0.2 V	D1 TP Vcc -- D1 TP ⊥ D	M14. +5 V/adj.	V80
+15V	± 0.1 V	D1 TP +15V -- D1 TP ⊥ A	M14. +15 V/adj.	n.a.
-15V	± 0.5 V	D1 TP -15V -- D1 TP ⊥ A	M14. -15 V/adj.	n.a.
+13V	± 0.2 V	M13 +13V -- M13 GND	n.a.	n.a.
+27V	- 0.5 V	D3X3.2 -- D3 X3.3	n.a.	n.a.
+24V	+ 5.5V	D3X1.9 -- D3 X1.7	n.a.	n.a.
200V~	+15V	Generator line filter Z1.3 -- Z1.4	n.a.	n.a.
230V~	+16V	M14 N.2 -- M14 N.1	n.a.	n.a.

I.I. voltages

NOTE

The needed electrode voltages of the I.I. are printed in the I.I. test certificate 1, delivered with the I.I.

Roederstein I.I. mini voltage supply

The E1/E2/E3 and A voltages may be taken from the I.I. test protocol and checked or adjusted on the basis of the control test points listed in table 3.

Voltage	Test point	Ground point (0V)	Potentiometer for full format	Potentiometer for zoom format	Voltage divider ratio
E1	UE1	⊥	P10	P11	1:1
E2	UE2	⊥	P6	P7	1:1
E3	UI 15	⊥	P2	P3	1:10000
30 kV, anode	UI 30	⊥	P1	P1	1:10000

⚠WARNING

After the electrode voltages are adjusted, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety Information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Spellman I.I. mini voltage supply

The E1/E2/E3 and A voltages may be taken from the I.I. test protocol and checked or adjusted on the basis of the control test points listed in table 3.

Tab. 1 Test points and voltage divider ratio

Voltage	Test point	Test point Ground (0V)	Voltage divider ratio
E1	TP1	TP G	1:100
E2	TP2	TP G	1:200

Voltage	Test point	Test point Ground (0V)	Voltage divider ratio
E3	TP3	TP G	1:3333
Penning	TP P	TP G	1:1000
Anode	TP A	TP G	1:10000

Adjustment

Tab. 2 DIP switches

DIP switches	1	2	3	4
Normal status	ON	OFF	OFF	OFF
Adjustment E1 (U1)	ON	OFF	ON	OFF
Adjustment E2 (U2)	ON	ON	OFF	OFF
Adjustment E3 (U3)	ON	ON	ON	OFF

NOTE

DIP switch 1:

Pos. OFF = 25kV anode voltage, not adjustable Pos. ON = 30 kV anode voltage, not adjustable.

For the ARCADIS I.I. types, dip switch 1 must always be set to the position “ON” (= 30 kV anode voltage).

1. Before performing the voltage adjustment for one of the electrodes, set the corresponding DIP switches to the position described in the“DIP switches” table and connect a digital multimeter to the correct test points, described in the” Test points and voltage divider ratio” table.
2. According to the activated DIP switch, adjust the E1, E2 or E3 value by using the “Adjustment” potentiometer.
3. After the correct voltage is adjusted, switch off the corresponding DIP switches.

   ➪ The adjusted voltage value for this electrode is stored.

- If needed, set the DIP switches for the next electrode adjustment and adjust the next electrode voltage.
- If needed, select the next I.I. zoom format and repeat the voltage adjustments for the electrodes E, E2 and E3 for the I.I. zoom format.

⚠WARNING

After the electrode voltages are adjusted, the accuracy of an optionally installed navigation system is no longer guaranteed.

See the chapter "Prerequisites," section "Safety information and protective measures."

➪ **If an optionally installed navigation system is present, the customer must be notified that the accuracy of the installed navigation system is no longer guaranteed, and that the navigation system must be checked and certified before it is used again.**

Brake force calibration

1. Position prerequisites for measuring the forces: angulation, orbital, and horizontal swivel movements must be at zero on the scale and horizontal movement should be at 20 on the scale.
2. All measurements should be made using a spring balance on the rail near the image intensifier with the DHHS spacer, if present, installed on the X-ray tube.

Movement	Nominal values		Comments
	Brake released:	Brake applied:	
Horizontal travel	10 N to 40 N	160 N to 200 N	n.a.
Angulation movement	10 Nm to 20 Nm	60 Nm to 80 Nm	n.a.
Orbital movement	10 Nm to 18 Nm	55 Nm to 70 Nm	Measure with the C-arm in the vertical position.
Horizontal pivot	5 Nm to 10 Nm	90 Nm to 150 Nm	n.a.

Adjustment of the angulation brake

Systems without optional angulation drive

Fig. 42: Angulation brake_1

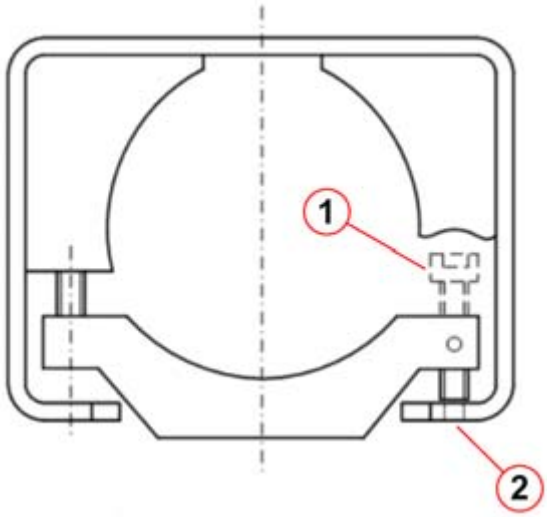

Fig. 43: Angulation brake_2

- Remove the plug (1/Fig. 42 / p. 94) and adjust the angulation brake with a 6 mm Allen key (1/Fig. 43 / p. 94).

Systems with optional angulation drive (in conjunction with VARIOSTAR)

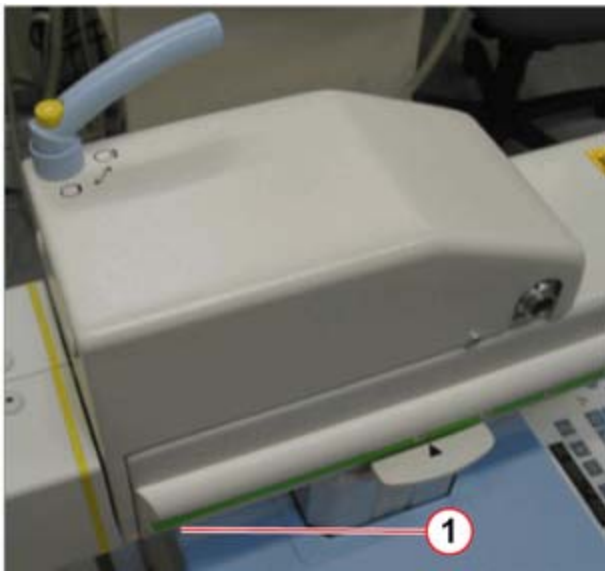

Fig. 44: Angulation brake_3

- The angulation brake is adjusted with a grub screw (4 mm Allen key) that can be reached through a hole on the bottom of the horizontal carriage (2/Fig. 43 / p. 94),(1/Fig. 44 / p. 95).

Lubricating the vertical column

1. The spindle in the vertical column should be lubricated during annual maintenance.
2. Raise the vertical column approximately 50 cm. A drilled hole is visible in the column.
3. Fill this hole with approximately 2 cm^3 of oil.
4. Oil to be used: Special purpose oil (Optimol GmbH; Viscogen KL300; 40 g), item number 73 95 353 RH090.

Supplement, measuring the tube current

NOTE

When measuring the tube current, the distribution current must be derived from the measured value. The distribution current depends on the kV and is calculated according to Ohm‘s law. The distribution resistance is 400 MOhm.

1. Switch the system OFF.
2. Remove jumper X97 from board D1.
3. Connect the mA measuring device at D1.X39 and D1.X40.
4. Switch the system ON.
5. Release radiation and read the overall current.

6. Read out the kV value produced while the current is being measured.
   Calculate the tube current as follows:

$$\text{tube current [mA]} = \text{overall current [mA]} - \frac{\text{high voltage [kV]}}{\text{distribution resistance [MOhm]}}$$

e.g.:
At 110 kV, an overall current of 5.275 mA is measured.

$$\text{tube current [mA]} = 5.275\ \text{[mA]} - \frac{110\ \text{[kV]}}{400\ \text{[MOhm]}} = 5.275\ \text{[mA]} - 0.275\ \text{[mA]} = \mathbf{5.0\ [mA]}$$

Section “Adjustment of the angulation brake” added.